

**Proceedings of the American Academy of Arts and Sciences.**

**VOL. 64. No. 12.—OCTOBER, 1930.**

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## RECORDS OF MEETINGS

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One thousand one hundred and sixth-seventh meeting

OCTOBER 10, 1928.—STATED MEETING

The Academy met at its House at 8.30 P. M.

The **PRESIDENT** in the Chair.

There were present seventy-five Fellows and Associates and five guests.

The records of the Annual Meeting of May 9 were read and approved.

The Corresponding Secretary announced the receipt of letters accepting Fellowship from Adelbert Ames, Jr., J. P. Baxter, 3d, E. S. Brightman, J. W. M. Bunker, A. H. Cole, A. H. Compton, W. F. Dearborn, W. Y. Elliott, R. T. Fisher, L. J. Gillespie, C. H. Haring, R. G. Hoskins, W. L. Jepson, A. C. Knudson, W. T. Longcope, T. H. Morgan, W. L. Moss, J. H. Mueller, W. A. Nitze, Johnson O'Connor, C. H. Page, Langdon Pearse, R. B. Perry, W. M. Persons, George Scatchard, A. M. Schlesinger, J. F. Stevens, J. D. Tamarkin, Charles Terzaghi, M. S. Vallarta, H. B. Washburn, and Joshua Whatmough; of letters accepting Foreign Honorary Membership from F. A. Bather, H. L. Bergson, Benedetto Croce, Louis Dollo, Viscount Haldane, Edmund Husserl, Wolfgang Köhler, Mikinosuke Miyajima, Hanns Oertel, C. H. Ostenfeldt, Friedrich Paschen, Karl Pearson, A. C. Pigou, C. Tate Regan, A. B. Rendle, S. P. L. Sörensen, and D. W. Thompson; of letters accepting Associate Membership from F. G. Balch, C. F. D. Belden, R. W. Boyden, F. P. Cabot, J. C. Cobb, Howard Coonley, W. L. W. Field, E. J. Holmes, R. L. O'Brien, A. S. Pier, A. L. Ripley, Odin Roberts, Jeremiah Smith, Jr., Payson Smith, Eliot Wadsworth, and E. A. Whitman; and of letters declining Associate Membership from the Earl of Camperdown and T. G. Frothingham.

The President announced the death of four Fellows:—Maurice Bloomfield (Class III, Section 2), Samuel Fessenden Clarke (Class II, Section 3), Pliny Earle Goddard (Class III, Section 2), John Warren (Class II, Section 4); and of two Foreign Honorary Members:—Viscount Haldane (Class III, Section 1), John Horne (Class II, Section 1).

The Fellows and Associates elected in May were then presented.

The following communication was presented:

Mr. George W. Pierce: "Some New Discoveries about Magnetostriction and the Possibility of its Application in the Industrial Arts."

Five papers were presented by title:

"The Compressibility and Pressure Coefficient of Resistance of Zirconium and Hafnium," by P. W. Bridgman.

"The Effect of Pressure on the Rigidity of Steel and Several Varieties of Glass," by P. W. Bridgman.

"The Effect of Pressure on the Resistance of Three Series of Alloys," by P. W. Bridgman.

"The Electrical Resistance of Alloys under Pressure," by C. W. Ufford. Presented by P. W. Bridgman.

"Thermo-Electric Phenomena and Electrical Resistance in Single Metal Crystals," by P. W. Bridgman.

The meeting was dissolved at ten o'clock.

**One thousand one hundred and sixty-eighth meeting.**

NOVEMBER 14, 1928.—STATED MEETING.

The Academy met at its House at 8.35 P. M.

The **PRESIDENT** in the Chair.

There were present fifty-three Fellows and Associates.

The records of the meeting of October 10 were read and approved.

The Corresponding Secretary reported for the Council the appointment of Lionel S. Marks to represent the Academy as delegate at the inauguration of Harvey Nathaniel Davis as President of the Stevens Institute of Technology.

The President announced the death of three Fellows: William Herbert Bixby (Class I, Section 4), Peter Schwamb (Class I, Section 4), and William Milligan Sloane (Class III, Section 3).

The following communication was presented:

Mr. William B. Munro: "Political Campaigns, Then and Now."

One paper was presented by title: "Table of Lagrangean Coefficients for Interpolating without Differences," by Edward V. Huntington.

The meeting was dissolved at 9.30 P. M.

**One thousand one hundred and sixth-ninth meeting.****DECEMBER 12, 1928.—STATED MEETING.**

The Academy met at its House at 8.40 P. M.

The **PRESIDENT** in the Chair.

There were present forty-three Fellows and Associates and twenty-seven guests, including ladies.

The meeting was preceded by a subscription dinner held in the Reading Room of the Academy. This was attended by thirty-eight Fellows and Associates and twenty-seven guests, including ladies.

The records of the meeting of November 14 were read and approved.

The Corresponding Secretary reported the receipt of a biographical memoir of William Otis Crosby, by A. C. Lane.

The President announced the death of three Fellows: Thomas Chowder Chamberlin (Class II, Section 1), William North Rice (Class II, Section 1), and John Donnell Smith (Class II, Section 2).

The following communications were presented:

Dr. Walter B. Cannon: "Endocrine Factors in Relation to Physical Conditions."

Dr. Roy G. Hoskins: "Endocrine Factors in Personality Disorders."

The meeting was dissolved at ten o'clock.

**One thousand one hundred and seventieth meeting.****JANUARY 9, 1929.—STATED MEETING.**

The Academy met at its House at 8.20 P. M.

**VICE-PRESIDENT** Kennelly in the Chair.

There were present forty-one Fellows and Associates and five guests.

The records of the meeting of December 12 were read and approved.

The Corresponding Secretary reported the receipt of a letter from Thomas Nelson Perkins accepting his election as an Associate.

The Chair announced the death of John Merle Coulter, Fellow in Class II, Section 2.

The following communications were presented:

Mr. George D. Birkhoff: "Eastern and Western Music from a Mathematical Point of View."

Mr. Arthur N. Holcombe: "The Chinese Revolution."

The meeting was dissolved at 10.30 P. M.

**One thousand one hundred and seventy-first meeting.**

FEBRUARY 13, 1929.—STATED MEETING.

The Academy met at its House at 8.20 P. M.

VICE-PRESIDENT Parker in the Chair.

There were present twenty-two Fellows and two guests.

In the absence of the Recording Secretary, the Corresponding Secretary was asked to assume his duties.

The records of the meeting of January 9 were read and approved.

The Corresponding Secretary reported the receipt of a biographical memoir of George Washington Goethals, by I. N. Hollis.

He also announced that Professor William A. Setchell, of the University of California, had been appointed to represent the Academy at the Pacific Science Congress in Java, May 16–25, 1929.

A letter was read by the Corresponding Secretary from Edward H. Warren, resigning Fellowship because of residence hereafter in England.

The Treasurer called attention to the condition of the General Fund of the Academy, stating that the income from this Fund during the last eight years has not covered expenses, and that the contingent fund of 1912, by which the deficit has been met, is now nearly exhausted. A general discussion followed.

The Chair announced the death of three Fellows: Thomas Burr Osborne (Class I, Section 3), Frederick Cheever Shattuck (Class II, Section 4), and William Lyman Underwood (Class II, Section 3).

The following communication was presented:

Mr. George J. Peirce, Professor of Botany, Stanford University: "The Organisms in Brine Lakes."

The meeting was dissolved at 9.55 P. M.

**One thousand one hundred and seventy-second meeting.****MARCH 13, 1929.—STATED MEETING.**

The Academy met at its House at 8.20 P. M.

**VICE-PRESIDENT** Kittredge in the Chair.

There were present forty-two Fellows and Associates and ten guests.

The records of the meeting of February 13 were read and approved.

The Corresponding Secretary presented a letter from George Hunt Barton resigning Fellowship.

The Chair announced the death of the following Fellows: Charles Lemuel Nichols (Class III, Section 3) and Allyn Abbott Young (Class III, Section 3).

On recommendation of the Council the following appropriations were made for the ensuing year:

From the income of the General Fund, \$7,775, to be used as follows:

for General and Meeting expenses .....	\$1,000
for Library expenses .....	\$2,000
for Books, Periodicals, and Binding .....	1,300
for House expenses .....	2,500
for Treasurer's expenses .....	975
	_____
	\$7,775

From the Income of the Publication Fund, \$4,209.50, to be used for publication.

From the income of the Rumford Fund, \$6,303.51, to be used as follows:

for Research .....	\$2,750.00
for Books, Periodicals, and Binding .....	200.00
for Publication .....	600.00
for use at the discretion of the Committee .....	2,753.51
	_____
	\$6,303.51

From the income of the C. M. Warren Fund, \$1,140, to be used at the discretion of the Committee.

The Chair announced the appointment of the Nominating Committee:

Harvey N. Davis, of Class I  
Herbert V. Neal, of Class II  
Edward W. Forbes, of Class III

The following communications were presented:

Mr. James Gray, Lecturer in Experimental Zoölogy, Cambridge University; "Ciliary Action as Studied by Moving Picture Methods," with moving picture illustrations.

Mr. G. H. Parker: "The Cilia of the Oviducts."

One paper was presented by title: "Alternating-Current Nets," by A. E. Kennelly.

The meeting was dissolved at 9.30 P. M.

**One thousand one hundred and seventy-third meeting.**

APRIL 10, 1929.—STATED MEETING.

The Academy met at its House at 8.15 P. M.

VICE-PRESIDENT Parker in the Chair.

There were present twenty-one Fellows.

In the absence of the Recording Secretary, the Corresponding Secretary was asked to assume his duties.

The records of the meeting of March 13 were read and approved.

From the Council the Corresponding Secretary announced the appointment of Mr. Curtis Hidden Page to be delegate of the Academy and to present an address at the 25th Anniversary of the American Academy of Arts and Letters in New York City on April 24 and 25.

The Chair announced the death of Charles Henry Brent, Fellow in Class III, Section 1, and of Ferdinand Foch, Foreign Honorary Member in Class I, Section 4.

Mr. Kennelly presented the report of the Committee on the Simplification of the Calendar, consisting of Messrs. Kennelly, O'Brien, Schlesinger, Shapley, and Whitman, appointed by the Council to consider two questions submitted by the National Committee on Calendar Simplification for the United States.

Upon recommendation of the Committee, it was

*Voted*, 1. That the Academy favors a change or simplification of the present calendar.

2. That the principle favored is that of thirteen months of twenty-eight days each.

Mr. Kennelly submitted a third question proposed in a more recent communication by the National Committee, and on motion it was

*Voted*, That the Academy approves the calling of an international conference, to be participated in by the United States, to consider the calendar question without being committed to any special principle of revision.

The following communication was presented:

Mr. Edward V. Huntington: "The Mathematical Aspects of the Problem of Reapportionment in Congress," with lantern illustrations.

The meeting was dissolved at 10.10 P. M.

**One thousand one hundred and seventy-fourth meeting.**

MAY 8, 1929.—ANNUAL MEETING.

The Academy met at its House at 8.20 P. M.

The PRESIDENT in the Chair.

There were present forty-six Fellows and Associates and two guests. The records of the meeting of April 10 were read and approved.

The Corresponding Secretary announced the appointment of Willard L. Sperry and Edward C. Moore as delegates to the Fifth International Congress of the History of Religions at Lund, Sweden, August 27-29, 1929.

The following report of the Council was presented:

**REPORT OF THE COUNCIL.**

Since the last report of the Council there have been reported the deaths of seventeen Fellows: William Herbert Bixby, Maurice Bloomfield, Charles Henry Brent, Thomas Chrowder Chamberlin, Samuel Fessenden Clarke, John Merle Coulter, Pliny Earle Goddard, Charles Lemuel Nichols, Thomas Burr Osborne, William North Rice, Peter Schwamb, Frederick Cheever Shattuck, William Milligan Sloane, John Donnell Smith, William Lyman Underwood, John Warren, Allyn Abbott Young; and of three Foreign Honorary Members: Ferdinand Foch, Viscount Haldane, and John Horne.

Thirty-three Fellows, eighteen Foreign Honorary Members, and twenty-one Associates were elected by the Council and announced to the Academy in May 1928.

The roll now includes 580 Fellows, 81 Foreign Honorary Members, and 33 Associates (not including those elected in May 1929).

The annual report of the Treasurer, Ingersoll Bowditch, was read, of which the following is an abstract:

#### GENERAL FUND.

##### *Receipts.*

From Investments . . . . .	\$2,837.97
From Assessments . . . . .	3,720.00
From Admissions . . . . .	390.00
From Interest on Deposits . . . . .	209.75
From Rumford Fund Income . . . . .	200.00
From Fund for Current Expenses . . . . .	414.24 \$7,771.96

##### *Expenditures.*

Expenses of Library . . . . .	\$2,042.00
Treasurer's Expenses . . . . .	825.97
Books and Binding . . . . .	1,138.06
General Expenses . . . . .	847.92
House Expenses . . . . .	2,323.98
President's Expenses . . . . .	4.45
Biographical Notice . . . . .	44.21 \$7,226.59
Transferred to Publication Fund . . . . .	\$250.00
Income transferred to Principal . . . . .	295.37 545.37 \$7,771.96

#### RUMFORD FUND.

##### *Receipts.*

Income on hand April 1, 1928 . . . . .	\$14,192.10
From Investments . . . . .	\$4,443.37
From Harvey N. Davis, unexpended grant returned . . . . .	158.97 4,602.34 \$18,794.44

*Expenditures.*

Purchase and Binding of Books . . . . .	\$292.25
Publications . . . . .	370.69
Research . . . . .	2,300.00
Cases for Medals and Engraving . . . . .	57.00
Transferred to General Fund Income for care of books . . . . .	200.00
	<u>\$3,219.94</u>
Income transferred to Principal . . . . .	10,210.42
	<u>\$13,430.36</u>

## WARREN FUND.

*Receipts.*

Income on hand April 1, 1928 . . . . .	\$934.51
From Investments . . . . .	1,188.00

*Expenditures.*

Research . . . . .	\$2,000.00
Vault Rent, part . . . . .	3.00
Income transferred to Principal . . . . .	<u>59.20</u>

## PUBLICATION FUND.

*Receipts.*

Income on hand April 1, 1928 . . . . .	\$4,838.82
From Income Appleton Fund . . . . .	\$1,590.98
From Income Centennial Fund . . . . .	2,448.82
From Author's Reprints . . . . .	868.73
From Sale of Publications . . . . .	666.21
From General Fund Income . . . . .	<u>250.00</u>

*Expenditures.*

Publications . . . . .	\$3,867.33
Vault Rent, part . . . . .	10.00
Adjustment of Interest and Dividends on stock bought . . . . .	2.54
Income transferred to Principal . . . . .	<u>199.32</u>

## FRANCIS AMORY FUND.

*Receipts.*

From Investments . . . . .	\$2,139.95
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*Expenditures.*

Publishing Statement . . . . .	\$ 66.25
Income transferred to Principal . . . . .	2,073.70 \$2,139.95

The following reports were also presented:

## REPORT OF THE LIBRARY COMMITTEE.

During the year 118 volumes and 25 unbound numbers of periodicals have been borrowed by 20 Fellows and 13 libraries, and many more have been consulted at the Academy. All books taken out have been returned or satisfactorily accounted for.

The number of books on the shelves at the time of the last report was 41,239. During the year 402 volumes were added, making the number now 41,641. This includes 51 purchased from the General Fund, 35 from the Rumford Fund, and 316 received by gift or exchange. The number of pamphlets added was 115.

The following appropriations were placed at the disposal of the Committee during the past year:

Balance from General Fund . . . . .	\$ 340.21
Appropriation from General Fund . . . . .	3,200.00
Balance from Rumford Fund . . . . .	113.94
Appropriation from Rumford Fund . . . . .	200.00
Total . . . . .	\$3,854.15

The expenses charged to the library during the financial year ending April 1, 1929, were:

Salaries . . . . .	\$2,000.00
Binding:	
General Fund . . . . .	\$543.05
Rumford Fund . . . . .	62.90 605.95

## Purchase of Books and Periodicals:

General Fund . . . . .	\$595.01
Rumford Fund . . . . .	229.35
	_____
Miscellaneous . . . . .	42.00
	_____
Total . . . . .	\$3,472.31

There remained on April 1, 1929, an unexpended balance of \$381.84, allocated as follows:

General Fund . . . . .	\$360.15
Rumford Fund . . . . .	21.69

H. M. GOODWIN, *Librarian.*

May 8, 1929.

## REPORT OF THE RUMFORD COMMITTEE.

The Rumford Committee held five meetings during the academic year 1928-1929 (May 9, October 10, December 12, January 9, April 10).

The Committee made the following grants during the year, in aid of research in heat and light:—

## 1928

No. 270. May 9—Dr. W. J. Luyten, Harvard College Observatory, for photographic supplies in research on stellar luminosities . . . . .	\$300
No. 271. Dec. 12—Prof. P. W. Bridgman, Harvard University, for materials in investigations of thermal and optical properties of matter especially at high pressures . . . . .	500
No. 272. Dec. 12—Prof. Arthur H. Compton, the University of Chicago, for optical equipment in photographing tracks of beta rays excited by X-rays . . . . .	500
No. 273. Dec. 12—Prof. George W. Pierce, Harvard University, for equipment in research on light waves and electromagnetic waves . . . . .	500

1929

No. 274. Jan. 9—Prof. H. T. Stetson, Harvard University, for apparatus in investigating effects of va- riation in solar radiation on ionisation of the earth's upper atmosphere . . . . .	300
<b>Total. . . . .</b>	<b>\$2,100</b>

Progress reports concerning researches aided by Rumford grants have been received from Messrs. R. T. Birge, P. W. Bridgman, A. H. Compton, J. C. Hubbard, N. A. Kent, G. W. Pierce, J. R. Roebuck and Harlow Shapley.

The following recent publications relate to researches that have been aided by Rumford grants:—

“Ionic Study of the Physical Properties of Liquids. The Velocity of Sound in Some Organic Liquids and their Compressibilities” by E. B. Freyer with J. C. Hubbard and Donald H. Andrews. *Jour. of Am. Chem. Soc.*, Vol. 51, pp. 759–769, 1929.

“The compressibility of Several of the Elements” by P. W. Bridgman, *Proc. Am. Ac. Arts & Sc.*, Vol. 62, No. 8.

“Thermoelectric Properties in Single Crystals” by P. W. Bridgman, *Proc. Am. Ac. Arts & Sc.*, Vol. 63, No. 9.

“The Pressure Transitions of the Rubidium Halides” by P. W. Bridgman, *Zeitschrift für Krystallographie*, 1928. Vol. 67, p. 363.

“Intensity Relations in the Spectra of Titanium” by George R. Harrison, *Jour. Optical Soc. of Am.*, Dec. 1928. Vol. 17, No. 6, pp. 389–416.

Respectfully submitted,  
A. E. KENNELLY, *Chairman*.

#### REPORT OF THE C. M. WARREN COMMITTEE.

The Committee had at its disposal at the beginning of the fiscal year 1928–1929, \$2,059.31, of which \$886.24 was a balance from the previous year. Two thousand dollars (\$2,000) have been appropriated during the year, leaving a balance of \$59.31. The estimated available income for the year 1929–1930 is \$1,184.00.

Since the last annual report grants have been made as follows:

May 21, 1928: to Dr. Charles F. H. Allen, Tufts College, \$200, a renewal of a previous grant to continue his study of the addition reactions of Vinyl Phenyl Ketone.

May 21, 1928: to Professor Ben Corson, Middlebury College, \$200, a renewal of a previous grant to continue his work on the Preparation of Malononitrile.

May 21, 1928: to Dr. Mary L. Sherrill, Mount Holyoke College, \$600, for the experimental study of some unsaturated organic compounds from the standpoint of recent theories of atomic structure.

June 10, 1928: to Professor Avery A. Morton, Massachusetts Institute of Technology, \$500, to aid him in the study of the addition of mercuric acetate to olefins.

October 4, 1928: to Professor Evald L. Skau, Trinity College, \$200, to aid him in the study of melting points at low temperatures.

October 4, 1928: to Professor W. D. Bonner, University of Utah, \$300, for the purchase of apparatus to be used in the precise measurement of boiling temperatures.

Reports of progress have been received from Professor Ben Corson, Professor Carl L. A. Schmidt, Professor Ralph H. Bullard, Professor Evald L. Skau, Dr. Charles F. H. Allen and Professor Avery A. Morton, and Professor Mary L. Sherrill.

The papers listed below, recently published, describe the results of investigations aided by the Warren Fund. In each case there is an acknowledgment by the author of the assistance received.

*Ben B. Corson and Roger W. Stoughton*—"Reactions of Alpha, Beta-Unsaturated Dinitriles," J. A. C. S., 50, 2825 (1928).

"Preparation of Malononitrile" (Submitted to Organic Syntheses).

*Carl L. A. Schmidt and Paul L. Kirk*—"The Dissociation Constants of Certain Amino Acids," The Journal of Biological Chemistry, Vol. LXXXI, No. 2, February, 1929.

*Ralph H. Bullard and Raymond A. Vingee*—"Some Derivatives of Trimethylethylstannane," J. A. C. S., 51, 892 (1929).

*Evald L. Skau and Harry F. Meir*—"The Transition Temperature of Carbon Tetrachloride as a Fixed Point in Thermometry." A Correction to an Article of this title by McCullough and Phipps. (Submitted to the Journal of the American Chemical Society.)

*Dr. Charles F. H. Allen*—Research on Vinyl Phenyl Ketone has

been completed and the results embodied in a paper, submitted to the Journal of the American Chemical Society.

JAMES F. NORRIS, *Chairman.*

**REPORT OF THE COMMITTEE OF PUBLICATION.**

The sixty-third volume of the Proceedings is just finished. It contains eleven scientific papers, and the Records number; 524 pages in all.

There is on hand for publication three extensive memoirs on the language of the Paiute Indians by Professor E. Sapir of the University of Chicago. All of these memoirs are to be published as Proceedings and their publication will cost in the neighborhood of \$6,000. They were submitted to us through Professor Franz Boas of Columbia University who will contribute \$1,500 towards their publication in accordance with a letter received from him dated April 11, 1929.

We also have on hand for publication a paper by Professor A. E. Kennelly.

The available funds for next year are as follows:

Balance from previous year . . . . .	\$ 6,292.19
Appropriated for next year . . . . .	4,209.50
Unexpended appropriation from the Rumford fund including an appropriation of \$600 for next year . . . . .	2,052.52
Contribution by Prof. Boas . . . . .	1,500.00
 Total . . . . .	 \$14,054.21

Respectfully submitted,  
WM. S. FRANKLIN, *Chairman.*

**REPORT OF THE HOUSE COMMITTEE.**

The House Committee has had funds at its disposal amounting to \$3,477.61, made up as follows:

Balance from last year . . . . .	\$ 312.61
Appropriation for 1928-1929 . . . . .	2,850.00
Received for use of rooms . . . . .	315.00
	 \$3,477.61

Of this amount, the sum of \$2,518.68 has been spent for the usual routine expenses, janitor, light, power, heat, telephone, etc., and \$120.30 has been spent for upkeep and equipment, making a total of \$2,638.98, and leaving an unexpended balance of \$838.63.

Meetings have been held as follows:

The Academy . . . . .	8
American Antiquarian Society . . . . .	1
American Ramabai Association . . . . .	1
Archaeological Institute of America . . . . .	1
Chamber Music Club . . . . .	8
Circolo Italiano . . . . .	1
Geological Society of Boston . . . . .	2
Habit Clinic Committee . . . . .	3
Harvard-Technology Chemical Club . . . . .	7
Japan Society of Boston . . . . .	1
Mediæval Academy of America . . . . .	1
Musical Guild . . . . .	2
National Women's Farm and Garden Association . . . . .	1
New England Botanical Club . . . . .	9
Radcliffe College Club . . . . .	1
Saturday Morning Club . . . . .	1
Zeta Phi Fraternity . . . . .	1
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The Council Chamber has been used for Academy Council and Committee meetings, and also by the Trustees of the Children's Museum, the New England Farm and Garden Association, the Mediæval Academy of America, the Thursday Evening Club, etc.

A detailed list of expenditures follows:

Janitor . . . . .	\$ 974.00
Electricity {Light . . . . .	190.06
Power . . . . .	78.20
Coal . . . . .	931.00
Care of elevator . . . . .	80.08
Gas . . . . .	66.12

Water . . . . .	39.36
Telephone . . . . .	104.21
Ash tickets . . . . .	30.15
Upkeep . . . . .	62.20
Furnishings and equipment . . . . .	58.10
Janitor's supplies and sundries . . . . .	25.50
 Total Expenditure . . . . .	\$2,638.98

S. B. WOLBACH, *Chairman.*

May 8, 1929.

On the recommendation of the Treasurer, it was  
*Voted*, That the Annual Assessment for 1929-1930 be \$15.00.  
 The annual election resulted in the choice of the following officers  
 and committees:

EDWIN B. WILSON, *President*  
 ARTHUR E. KENNELLY, *Vice-President for Class I*  
 GEORGE H. PARKER, *Vice-President for Class II*  
 GEORGE L. KITTREDGE, *Vice-President for Class III*  
 ROBERT P. BIGELOW, *Corresponding Secretary*  
 CHARLES B. GULICK, *Recording Secretary*  
 INGERSOLL BOWDITCH, *Treasurer*  
 HARRY M. GOODWIN, *Librarian*  
 WILLIAM S. FRANKLIN, *Editor*

*Councillors for Four Years.*

FREDERICK A. SAUNDERS, *of Class I*    CHARLES T. BRUES, *of Class II*  
 IRVING BABBITT, *of Class III*

*Councillor for One Year.*

(To fill the unexpired term of E. H. Warren)  
 EDGAR S. BRIGHTMAN

*Finance Committee.*

THOMAS BARBOUR

PAUL J. SACHS

FREDERICK P. FISH

*Rumford Committee.*

ARTHUR E. KENNELLY		
ELIHU THOMSON	HARRY M. GOODWIN	HARLOW SHAPLEY
PERCY W. BRIDGMAN	CHARLES L. NORTON	FREDERICK A. SAUNDERS

*C. M. Warren Committee.*

JAMES F. NORRIS		
GREGORY P. BAXTER	ARTHUR D. LITTLE	REID HUNT
WALTER L. JENNINGS	FREDERICK G. KEYES	CHARLES A. KRAUS

*Publication Committee.*

(Editor) WILLIAM S. FRANKLIN, <i>ex officio Chairman</i>		
EDWIN C. KEMBLE, <i>of Class I</i>	FREDERIC T. LEWIS, <i>of Class II</i>	
GEORGE F. MOORE, <i>of Class III</i>		

*Library Committee.*

(Librarian) HARRY M. GOODWIN, <i>ex officio Chairman</i>		
RAYMOND C. ARCHIBALD, <i>of Class I</i>	THOMAS BARBOUR, <i>of Class II</i>	
WILLIAM C. LANE, <i>of Class III</i>		

*House Committee.*

S. BURT WOLBACH, <i>Chairman</i>		
ROBERT P. BIGELOW	WILLIAM H. LAWRENCE	

*Committee on Meetings.*

THE PRESIDENT		
THE RECORDING SECRETARY		
GEORGE H. PARKER	GREGORY P. BAXTER	WILLIAM C. GREENE

*Auditing Committee.*

GEORGE R. AGASSIZ	JOHN E. THAYER
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The Corresponding Secretary reported that the following gentlemen had been elected members of the Academy by the Council:

## FELLOWS.

## CLASS I.

- Section 1.* Marston Morse, Cambridge.  
Joseph Leonard Walsh, Cambridge.  
*Section 2.* Clinton Joseph Davison, New York, N. Y.  
Arthur Cobb Hardy, Wellesley.  
*Section 3.* James Alexander Beattie, Brookline.  
*Section 4.* William Sowden Sims, Newport, R. I.  
Arthur Edward Wells, Watertown.

## CLASS II.

- Section 1.* Kirk Bryan, Cambridge.  
*Section 2.* Joseph Horace Faull, Cambridge.  
Ernest Henry Wilson, Jamaica Plain.  
*Section 3.* Lemuel Roscoe Cleveland, Boston.  
Hallowell Davis, Cambridge.  
Joseph Grinnell, Berkeley, Calif.  
Leigh Hoadley, Cambridge.  
*Section 4.* James Bourne Ayer, Milton.  
Edwin Allen Locke, Boston.

## CLASS III.

- Section 1.* Clarence Irving Lewis, Cambridge.  
Russell Henry Stafford, Brookline.  
*Section 4.* Charles Townsend Copeland, Cambridge.  
Edward Burlingame Hill, Cambridge.

## FOREIGN HONORARY MEMBERS.

## CLASS I.

- Section 1.* Willem de Sitter, Leyden.  
Hermann Weyl, Zürich.  
*Section 2.* Vilhelm Bjerknes, Oslo.  
James Franck, Göttingen.  
Abram F. Joffé, Leningrad.

*Section 3.* Johannes N. Brönsted, Copenhagen.

Heinrich Wieland, Munich.

*Section 4.* Ludwig Prandtl, Göttingen.

Emil Probst, Karlsruhe.

Aurel Stodola, Zürich.

### CLASS II.

*Section 1.* Léon William Collet, Geneva.

*Section 2.* Otto Renner, Jena.

*Section 4.* Sir Robert Jones, Bart, Liverpool.

Sir Arnold Theiler, London.

### CLASS III.

*Section 1.* Etienne Gilson, Melun, France.

The Marquess of Reading, London.

*Section 4.* Joseph Bédier, Paris.

Baron Charnwood, Lichfield.

Paul Hazard, Paris.

The following communication was presented:

Mr. Joshua Whatmough: "Who were the Indo-Europeans?"

The following papers were presented by title:

"On Signalling by Sound Waves," by G. W. Pierce.

"Experimental Measurements of the Velocity of Sound in Air at Ultra-Sonic Frequencies," by Charles D. Reid, presented by G. W. Pierce.

"Experiments Preliminary to a Measurement of the Velocity of Light," by Austin R. Frey, presented by G. W. Pierce.

"A Synopsis of the Crustacea Entomostraca of New England," by Charles H. Blake, presented by Robert P. Bigelow.

The meeting was dissolved at 9.55 P. M.

### One thousand one hundred and seventy-fifth meeting.

OCTOBER 9, 1929.—STATED MEETING.

The Academy met at its House at 8.15 P. M.

The PRESIDENT in the Chair.

There were present fifty-nine Fellows and Associates, one Foreign Honorary Member, and four guests.

In the absence of the Recording Secretary, the Corresponding Secretary was requested to assume his duties.

The records of the annual meeting of May 8 were read and approved.

The Corresponding Secretary reported the receipt of letters accepting Fellowship from J. B. Ayer, J. A. Beattie, Kirk Bryan, L. R. Cleveland, C. T. Copeland, Hallowell Davis, C. J. Davisson, J. H. Faull, Joseph Grinnell, A. C. Hardy, E. B. Hill, Leigh Hoadley, C. I. Lewis, E. A. Locke, Marston Morse, W. S. Sims, R. H. Stafford, J. L. Walsh, A. E. Wells, and E. H. Wilson; of letters accepting Foreign Honorary Membership from Joseph Bédier, V. F. K. Bjerknes, J. N. Brönsted, Baron Charnwood, L. W. Collet, James Franck, Etienne Gilson, Paul Hazard, A. F. Joffé, Sir Robert Jones, Ludwig Prandtl, Emil Probst, the Marquess of Reading, Otto Renner, Willem de Sitter, Aurel Stodola, Sir Arnold Theiler, Hermann Weyl, and Heinrich Wieland; and of a letter from Samuel Williston resigning Fellowship.

The Corresponding Secretary announced that Prof. Gilbert N. Lewis, of the University of California, had been appointed a delegate to represent the Academy in San Francisco, August 27 and 28, at the celebration of the 25th anniversary of the inauguration of research in terrestrial magnetism by the Carnegie Institution of Washington.

The President announced the death of two Fellows:—Charles Francis Brush (Class I, Section 4) and Frank Austin Gooch (Class I, Section 3); and of two Foreign Honorary Members:—Sir Edwin Ray Lankester (Class II, Section 3) and William Henry Perkin (Class I, Section 3).

The Fellows elected in May were then presented to the Academy.

Mr. J. D. M. Ford introduced Rector Henry Guy of the University of Grenoble, Foreign Honorary Member of the Academy, who addressed the Academy as its delegate to the Seventh Centenary of the University of Toulouse, from which he brought greetings and gifts, consisting of a medal and facsimiles of documents relating to the foundation of that university.

The following communication was presented:

Mr. Johnson O'Connor: "An Experiment in Measuring Aptitudes."

Four papers were presented by title:

"The Reflecting Power of Some Substances in the Extreme Ultra-Violet," by Paul R. Gleason, presented by Theodore Lyman.

"The Compressibility and Pressure Coefficient of Resistance of Several Elements and Single Crystals," by P. W. Bridgman.

"The Effect of Pressure on the Rigidity of Several Metals," by P. W. Bridgman.

"The Elastic Moduli of Five Alkali Halides," by P. W. Bridgman.

The meeting was dissolved at 9.45 P. M.

**One thousand one hundred and seventy-sixth meeting.**

**NOVEMBER 13, 1929.—STATED MEETING.**

The Academy met at its House at 8.40 P. M.

The **PRESIDENT** in the Chair.

There were present thirty-one Fellows and three guests.

On account of the illness of the Recording Secretary it was announced that Mr. J. D. M. Ford had been appointed Recording Secretary *pro tem.*

The records of the meeting of October 9 were read and approved.

The President announced that the Council on behalf of the Academy has entered into an agreement with the Boston Safe Deposit and Trust Company to act as the disbursing agent of the income of a Permanent Science Fund established by that company on September 5, 1928. For this purpose a Committee on the Permanent Science Fund has been appointed, with Dr. S. B. Wolbach as Chairman. The amount currently available for disbursement is estimated at about \$2,700 a year, to be used in the aid of scientific research.

The Corresponding Secretary announced that the Council had approved a grant from the above of five hundred dollars to Dr. Harlow Shapley to be devoted to the employment of an experienced assistant in measuring periods and light curves of variable stars of the Cepheid class.

On behalf of the Council he also reported that Mr. Herbert V. Neal had been appointed Editor to fill the unexpired term of Mr. William S. Franklin, resigned.

The Corresponding Secretary reported the receipt of a letter from Mr. Wilbur C. Abbott, resigning Fellowship.

He also announced that the President had appointed Mr. Lionel S. Marks and Mr. Edward F. Miller to represent the Academy as delegates at the convocation in celebration of the 50th Anniversary of the American Society of Mechanical Engineers.

The President announced the death of two Fellows: George Angier Gordon (Class III, Section 1) and Moorfield Storey (Class III, Section 1).

The following communication was presented:

Mr. John G. Jack: "The Study of Trees."

One paper was presented by title: "The Minimum of Resistance of High Pressure," by P. W. Bridgman.

The meeting was dissolved at 9.55 P. M.

**One thousand one hundred and seventy-seventh meeting.**

DECEMBER 11, 1929.—STATED MEETING.

The Academy met at its House at 8.25 P. M.

The PRESIDENT in the Chair.

There were present fifty-five Fellows and Associates and three guests.

The records of the meeting of November 13 were read and approved.

The Corresponding Secretary reported the receipt of a letter from Dr. David L. Edsall, resigning Fellowship.

It was *Voted*, To adopt the recommendation in the following report presented by the Chairman of the committee, Mr. Edwin H. Hall:

"The Committee for the Procurement of Biographical Notices recommends to the Academy that in the case of a deceased Foreign Honorary Member the biographical notice shall ordinarily be of a purely formal character, similar to the notice presented to the Academy at the time of his election, and that such a notice shall be prepared under the direction of the Corresponding Secretary."

Professor Charles R. Lanman then introduced the speaker of the evening, Sir Aurel Stein.

The subject of the communication was: "The Campaign of Alexander the Great on the Northwest Frontier of India," illustrated by lantern slides.

The meeting was dissolved at 9.45 P. M.

**One thousand one hundred and seventy-eighth meeting.****JANUARY 8, 1930.—STATED MEETING.**

The Academy met at its House at 8.28 P. M.

The **PRESIDENT** in the Chair.

There were present thirty-nine Fellows and Associates and nine guests.

The records of the meeting of December 11 were read and approved.

The Corresponding Secretary announced the resignation of Mr. Charles B. Gulick as Recording Secretary and also as a delegate of the Academy to the American Council of Learned Societies; and the appointment by the Council of Mr. J. D. M. Ford as delegate to the American Council for a term of four years.

He also reported the receipt of a letter from Langdon Warner, resigning Fellowship; and of a biographical memoir of Addison Emery Verrill, by Charles Schuchert.

It was announced that Messrs. J. D. M. Ford and Albert Sauveur had been appointed delegates to represent the Academy at the inauguration of new buildings at the University of Brussels, on June 23–25, 1930.

The President announced the death of William Rosenzweig Arnold, (Class III, Section 2) and of George Edward Woodberry, (Class III, Section 4).

He also urged the Fellows to send in nominations to membership before February 15.

The following communication was presented:

Dr. Joseph W. Schereschewsky: "The Present Status of the Cancer Problem."

The meeting was dissolved at 9.46 P. M.

**One thousand one hundred and seventy-ninth meeting.****FEBRUARY 12, 1930.—STATED MEETING.**

The Academy met at its House at 8.30 P. M.

The **PRESIDENT** in the Chair.

There were present thirty-one Fellows and Associates and ten guests.

The records of the meeting of January 8 were read and approved. The Corresponding Secretary reported that the Council had appointed Mr. J. D. M. Ford, Recording Secretary, to fill out the term of Mr. Charles B. Gulick, who had resigned.

The President announced the death of Edward Waldo Emerson, Fellow in Class III, Section 4.

The President called attention to the fact that nominations to membership in certain sections of Class III were needed.

On the recommendation of the Rumford Committee, it was

*Voted*, To award the Rumford Premium to John Stanley Plaskett, Director of the Dominion Astrophysical Observatory, Victoria, B. C., for his stellar spectrographic researches.

The following communication was presented:

Mr. J. Stanley Gardiner, M.A., F.R.S., Professor of Zoölogy and Comparative Anatomy in the University of Cambridge: "Coral Reefs."

One paper was presented by title: "The New World Species of the Genus *Solenopsis*," by William S. Creighton, presented by C. T. Brues.

The meeting was dissolved at 9.45 P. M.

One thousand one hundred and eightieth meeting

MARCH 12, 1930.—STATED MEETING.

The Academy met at its House at 8.38 P. M.

The PRESIDENT in the Chair.

There were present forty-six Fellows and Associates and four guests.

The records of the meeting of February 12 were read and approved.

The Corresponding Secretary reported the receipt of a biographical memoir of William Herbert Bixby, by E. H. Hall; and of a letter from Clarence Henry Haring, resigning Fellowship.

He also announced the appointment of William B. Munro as delegate of the Academy at the dedication of the new campus and buildings of the University of California, March 27 and 28, at Los Angeles.

On behalf of the Council the Corresponding Secretary announced a grant from the income of the Permanent Science Fund of \$600. to Prof. Charles T. Brues for the purchase of photographic equipment and materials to aid in a study of the movements of insects.

The President announced the death of three Fellows:—Arthur Twining Hadley (Class III, Section 3), Hector James Hughes (Class I, Section 4), and William Howard Taft (Class III, Section 1); and of one Foreign Honorary Member, Karl Friedrich Geldner (Class III, Section 2).

On recommendation of the Council the following appropriations were made for the ensuing year:

From the income of the General Fund, \$7,875, to be used as follows:	
for General and Meeting expenses . . . . .	\$1,000
for Library expenses . . . . .	2,100
for Books, Periodicals, and Binding . . . . .	1,300
for House expenses . . . . .	2,500
for Treasurer's expenses . . . . .	975
	_____
	\$7,875

From the income of the Publication Fund, \$4,235.57, to be used for publication.

From the income of the Rumford Fund, \$4,320.37, to be used as follows:

for Research . . . . .	\$2,750.00
for Books, Periodicals, and Binding . . . . .	300.00
for Publication . . . . .	600.00
for use at the discretion of the Committee . . . . .	670.37
	_____
	\$4,320.37

From the income of the C. M. Warren Fund, \$1,193.25, to be used at the discretion of the Committee.

The President appointed the Nominating Committee as follows:

Harlow Shapley, of *Class I.*

Louis C. Graton, of *Class II.*

Edgar S. Brightman, of *Class III.*

The following communication was presented:

Dr. William L. Moss: "With Cannibals and Head-Hunters."

One paper was presented by title: "The Anonymous La Conquista Del Peru (Seville, April 1534) and the Libro Vltimo Del Symmario

Delle Indie Occidentali (Venice, October 1534)," by Alexander Pogo, presented by J. D. M. Ford.

The meeting was dissolved at 9.39 P. M.

**One thousand one hundred and eighty-first meeting.**

**APRIL 9, 1930.—STATED MEETING.**

The Academy met at its House at 8.38 P. M.

The **PRESIDENT** in the Chair.

There were present forty-one Fellows and Associates and twelve guests.

In the absence of the Recording Secretary Mr. Walter E. Clark was asked to assume the duties of his office.

The records of the meeting of March 12 were read and approved.

The Corresponding Secretary announced that the Council on behalf of the Academy had ratified the constitution of the American Council of Learned Societies as amended at its meeting of January 11, 1930.

He also reported that Mr. Dayton C. Miller had been appointed delegate of the Academy at the semi-centennial of the Case School of Applied Science and inauguration of President Wickenden on April 11; and that Mr. Richard C. Tolman had been appointed to represent the Academy at the semi-centennial of the University of Southern California to be held at Los Angeles on June 4, 5, and 6.

The President announced the death of two Fellows:—Claude Halstead Van Tyne (Class III, Section 3) and Winslow Warren (Class III, Section 1); and of one Foreign Honorary Member, Arthur James Balfour, Earl of Balfour (Class III, Section 1).

The Rumford Medals were presented by the President to Dr. John Stanley Plaskett, Director of the Dominion Astrophysical Observatory, Victoria, B. C., for his stellar spectrographic researches, after Professor Arthur E. Kennelly, Chairman of the Rumford Committee, had made a statement in regard to the Rumford Premium and its recipient.

The following communication was presented:

Mr. John Stanley Plaskett: "The Gases of Interstellar Space."

The meeting was dissolved at 9.54 P. M.

**One thousand one hundred and eighty-second meeting.****MAY 14, 1930.—ANNUAL MEETING.**

The Academy met at its House at 8.35 P. M.

The PRESIDENT in the Chair.

There were present thirty-three Fellows and five guests.

The records of the meeting of April 9 were read and approved.

The Corresponding Secretary reported the receipt of biographical memoirs of William Rosenzweig Arnold, by J. R. Jewett, of William Sturgis Bigelow, by Arthur Fairbanks, of Maurice Bloomfield, by Franklin Edgerton, of Archibald Cary Coolidge, by W. S. Ferguson, of Pliny Earle Goddard, by R. B. Dixon, of George Angier Gordon, by F. G. Peabody, of Okakura-Kakuzo, by W. S. Bigelow and J. E. Lodge, of Theodore William Richards, by G. S. Forbes, and of Allyn Abbott Young, by F. W. Taussig.

He also announced that at the inauguration of Homer LeRoy Shantz as President of the University of Arizona on April 24 the Academy was represented by William M. Davis.

On behalf of the Council the Corresponding Secretary made the following announcements:

The Librarian has announced to the Council a gift to the Academy from Professor Arthur E. Kennelly of eight valuable sets of journals comprising in all 224 volumes. These will materially add to the completeness of the library, particularly in the field of radio and electrical engineering. The Council has voted to Mr. Kennelly the thanks of the Academy for this valuable gift.

A committee appointed by the President, with Mr. Goodwin as chairman, to confer with a committee of the Boston Society of Natural History, has reported that the two committees have met in joint session and have approved a plan for extending the use of the reading room and facilities of the library of each society to members of the other. It was recommended that persons desiring to use the library of the society of which they are not members, should present a card of introduction to the Librarian or his representative.

The extent of unnecessary duplication of accessions to the two libraries and how it may be reduced are questions to be considered by the committee upon the completion of a list now in preparation by

the Boston Society of Natural History. In the meantime, it is understood that reciprocal library privileges to members of the two societies will become operative.

The Council has adopted this report and has received notice of similar action by the Trustees of the Boston Society of Natural History.

It was announced that the Council had made the following grants from the Permanent Science Fund:

1. To Harlow Shapley, \$1,000, for the employment of an expert assistant in a systematic study of eclipsing binaries by means of the Harvard plates.
2. To C. I. Reed, \$500, for use in a study of the influence of irradiated ergosterol on metabolism.
3. To J. Leroy Conel, \$500, to be used for the collection of embryos of the hagfish, *Bdellostoma stouti*, necessary for the completion of researches on the development of the brain.

On the recommendation of the Council the Academy then passed a vote of thanks to Mr. Bernard A. Behrend for his gift of a large portrait in oil of Thomas Henry Huxley, painted by the Hon. John Collier.

The President announced the death of two Fellows:—Horace Howard Furness, Jr. (Class III, Section 4) and William Edward Story (Class I, Section 1).

He also called attention to the fact that the Academy is 150 years old this month, its charter having been granted on May 4, 1780, and the first meeting held on May 30, 1780.

The following report of the Council was presented:

#### REPORT OF THE COUNCIL.

Since the last report of the Council there have been reported the deaths of fourteen Fellows: William Rosenzweig Arnold, Charles Francis Brush, Edward Waldo Emerson, Horace Howard Furness, Jr., Frank Austin Gooch, George Angier Gordon, Arthur Twining Hadley, Hector James Hughes, Moorfield Storey, William Edward Story, William Howard Taft, Claude Halstead Van Tyne, Winslow Warren, George Edward Woodberry; and of four Foreign Honorary Members: The Earl of Balfour, Karl Friedrich Geldner, Sir Edwin Ray Lankester, William Henry Perkin.

Twenty Fellows and nineteen Foreign Honorary Members were elected by the Council and announced to the Academy in May 1929.

The roll now includes 579 Fellows, 96 Foreign Honorary Members, and 33 Associates (not including those elected in May 1930).

The annual report of the Treasurer, Ingersoll Bowditch, was read, of which the following is an abstract.

#### GENERAL FUND.

##### *Receipts.*

From Investments . . . . .	\$3,052.33
From Assessments . . . . .	5,505.00
From Admissions . . . . .	180.00
From Interest on Deposits . . . . .	363.45
From Rumford Fund Income . . . . .	<u>200.00</u> \$ 9,300.78

##### *Expenditures.*

Expenses of Library . . . . .	\$2,104.45
Treasurer's Expenses . . . . .	976.72
Books and Binding . . . . .	933.71
General Expenses . . . . .	885.57
House Expenses . . . . .	2,500.86
President's Expenses . . . . .	<u>2.10</u> \$7,403.41
Income transferred to Principal . . . . .	362.52 \$ 7,765.93

#### RUMFORD FUND.

##### *Receipts.*

Income on hand April 1, 1929 . . . . .	\$5,364.08
From Investments . . . . .	<u>4,672.72</u> \$10,036.80

##### *Expenditures.*

Purchase and Binding of Books . . . . .	\$ 335.45
Research . . . . .	1,815.43
Medals . . . . .	313.80
Transferred to General Fund Income for care of books . . . . .	<u>200.00</u> \$2,664.68
Interest on bonds bought . . . . .	\$ 117.93
Income transferred to Principal . . . . .	<u>216.79</u> <u>334.72</u> \$ 2,999.40

## WARREN FUND.

*Receipts.*

Income on hand April 1, 1929 . . . . .	\$ 60.31
From Investments . . . . .	1,228.75 \$ 1,289.06

*Expenditures.*

Research . . . . .	\$1,150.00
Vault Rent—part . . . . .	3.00 \$1,153.00
Income transferred to Principal . . . . .	60.00 \$ 1,213.00

## PUBLICATION FUND.

*Receipts.*

Income on hand April 1, 1929 . . . . .	\$6,584.37
From Income Appleton Fund . . . . .	\$1,662.50
From Income Centennial Fund . . . . .	2,586.50
From Authors' Reprints . . . . .	141.55
From Sale of Publications . . . . .	665.03 5,055.58 \$11,639.95

*Expenditures.*

Publications . . . . .	\$1,683.07
Vault Rent—part . . . . .	10.00 \$1,693.07
Interest on Bonds bought . . . . .	\$ 87.22
Charged to cancel premium on Bonds . . . . .	28.00
Income transferred to Principal . . . . .	206.18 321.40 \$ 2,014.47

## FRANCIS AMORY FUND.

*Receipts.*

From Investments . . . . .	\$ 2,208.00
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*Expenditures.*

Publishing Statement . . . . .	\$ 70.40
Income transferred to Principal . . . . .	2,137.60 \$ 2,208.00

## PERMANENT SCIENCE FUND.

*Receipts.*

Received for above fund . . . . .	\$ 1,739.42
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*Expenditures.*

Grants from above fund . . . . .	\$ 1,100.00
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The following reports were also presented:

## REPORT OF THE LIBRARY COMMITTEE.

During the year 127 volumes and 18 unbound numbers of periodicals have been borrowed by 15 Fellows and 10 libraries, and many more have been consulted at the Academy. All books taken out have been returned or satisfactorily accounted for.

The number of books on the shelves at the time of the last report was 41,641. During the year 385 volumes were added, making the number now 42,026. This includes 33 purchased from the General Fund, 19 from the Rumford Fund, and 333 received by gift or exchange. The number of pamphlets added was 95.

During the year three sets of periodicals, the Central-Zeitung für Optik und Mechanik, Nouvelles Annales de Mathématiques, and Scientia, were sold upon the recommendation of the Library Committee, and the proceeds added to the library fund.

The following appropriations were placed at the disposal of the Committee during the past year:

Balance from General Fund . . . . .	\$ 360.15
Appropriation from General Fund . . . . .	3,300.00
Sale of Periodicals . . . . .	280.00
Balance from Rumford Fund . . . . .	21.69
Appropriation from Rumford Fund . . . . .	400.00
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	\$4,361.84

The expenses charged to the Library during the financial year ending April 1, 1930, were:

Salaries . . . . .	\$2,000.00
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Binding:	
General Fund . . . . .	579.50
Rumford Fund . . . . .	78.00
Purchase of Books and Periodicals:	
General Fund . . . . .	634.21
Rumford Fund . . . . .	257.45
Miscellaneous . . . . .	104.45
Total. . . . .	\$3,653.61

There remained on April 1, 1930, an unexpended balance of \$708.23, allocated as follows:

General Fund . . . . .	\$621.99
Rumford Fund . . . . .	86.24

The Library has recently received from Professor Arthur E. Kennelly the valuable gift of eight sets of journals comprising in all 224 volumes. This acquisition will very materially increase the value of the Library for reference in the fields of radio and electrical engineering.

During the past year the Council has extended the privilege of consulting the Library and using the Reading Room to members of the Boston Society of Natural History, similar privileges being offered to members of the Academy by the Society. A special committee appointed by the President and a corresponding committee representing the Boston Society of Natural History, have at present under consideration plans for further co-operation between the libraries of the two institutions in matters pertaining to the purchase and acquisition of books and periodicals.

H. M. GOODWIN, *Librarian.*

May 14, 1930.

#### REPORT OF THE RUMFORD COMMITTEE.

The Rumford Committee held seven meetings during the academic year 1929-1930 (May 8, Nov. 13, Dec. 11, Jan. 8, Feb. 12, March 12, and April 9).

The Committee made the following grants from the Rumford Fund, during the year, in aid of researches on heat and light:—

1929

No. 275. May 9—Prof. E. L. Chaffee, Harvard University,	for equipment in research on electrical re-	
	sponses of the retina to light . . . . .	\$100
No. 276. Nov. 12—Prof. George R. Harrison, Stanford Uni-	versity, for equipment in research on spec-	
	trophotometry . . . . .	300
No. 277. Nov. 12—Dr. Annie J. Cannon, Harvard Observa-	tory, towards purchase of an objective	
	prism for stellar spectrophotographic re-	
	search . . . . .	500
No. 278. Dec. 11—Prof. Harlan T. Stetson, Ohio Wesleyan	University, Delaware, Ohio, for purchase	
	of equipment in solar radiation researches	200

1930

No. 279. Feb. 12—Dr. Norman Feather, Johns Hopkins Uni-	versity, for purchase of equipment in radio	
	absorption . . . . .	500
No. 280. Feb. 12—Prof. H. H. Plaskett, Harvard Observa-	tory, for purchase of equipment in re-	
	searches on astrophotometry . . . . .	500
No. 281. Mar. 12—Prof. P. W. Bridgman, Harvard Univer-	sity, for purchase of equipment in re-	
	searches on thermal and optical properties	
	of matter . . . . .	500
No. 282. Mar. 12—Prof. D. C. Stockbarger, Mass. Inst. of	Technology, Cambridge, for purchase of	
	equipment in researches in spectropho-	
	tometry . . . . .	500
No. 283. Apr. 9—Dr. G. H. Dieke, Johns Hopkins Univer-	sity, for equipment in spectrophoto-	
	graphic research (confirmation of action	
	taken March 12) . . . . .	300
Total . . . . .		\$3,400

The Committee voted unanimously, first on January 8, and again on February 12, 1930, to recommend the award of the Rumford Premium to Dr. John Stanley Plaskett, Director of the Dominion Astrophysical Observatory at Victoria, B. C. "for stellar spectrographic researches." The medals were presented to Dr. Plaskett by the President of the Academy at the meeting of April 9.

Reports of progress in researches conducted with the aid of grants from the Rumford Fund have been received from Messrs. S. Albrecht, R. T. Birge, A. H. Compton, J. C. Hubbard, G. W. Pierce, and H. Shapley.

The following recent publications concern researches that have been aided by grants from the Rumford Fund:

By Prof. George R. H. Harrison, Stanford University:

- (1) "Intensity Relations in the Spectra of Titanium," and "Relative Intensities of the Stronger Multiplets of Ti I," with Harry Engwicht. *The Journ. of the Optical Soc. of America and Review of Scientific Insts.*, Vol. 18, No. 4, April 1929, pp. 287-301.
- (2) "On the Elimination of Errors when Wire Screens are Used as Neutral Filters for Photographic Photometry," same journal as No. 1. Vol. 18, No. 6, June, 1929, pp. 492-502.
- (3) "Intensity Relations in the Spectra of Titanium III. Intensities in Super-Multiplets of Ti I," same journal, Vol. 19, No. 3, Sept. 1929, pp. 109-133.
- (4) "Instruments and Methods Used for Measuring Spectral Light Intensities by Photography," same journal, Vol. 19, No. 5, Nov. 1929, pp. 267-316.

By P. W. Bridgman, Harvard University:

- (5) "The Compressibility and Pressure Coefficient of Resistance of Several Elements and Single Crystals." *Proc. Am. Ac. of Arts and Sciences*, Vol. 64, No. 4, December 1929, pp. 51-73.

By Paul Kirkpatrick and Iwao Miyake, University of Hawaii:

- (6) "Polarization of the Tungsten L Radiations." *Proc. National Ac. of Sciences*, Vol. 15, No. 5, May 1929, pp. 418-421.

By Paul Kirkpatrick, University of Hawaii:

- (7) "Classical Scattering in X-ray Reflection." *Journ. of the Optical Soc. of America and Rev. of Sc. Insts.*, Vol. 18, No. 6, June 1929, pp. 452-458.

Respectfully Submitted,

A. E. KENNELLY, Chairman.

May 14, 1930.

#### REPORT OF THE C. M. WARREN COMMITTEE.

The Committee had at its disposal at the beginning of the fiscal year 1929-1930, \$1,199.31, of which \$1,150.00 have been appropriated during the past year.

Since the last annual report grants have been made as follows:

June 3, 1929: to Professor Allen B. Stowe, Kalamazoo College, \$300, to be used in connection with his work on the solubilities of salts in non-aqueous solvents.

June 3, 1929: to Professor Avery A. Morton, Massachusetts Institute of Technology, \$500, to aid him in the study of the preparation and properties of certain olefins heretofore not well characterized.

June 3, 1929: to Professor Samuel P. Mulliken, Massachusetts Institute of Technology, \$350, to be used to cover the cost of the preparation of certain rare hydrocarbons.

Reports of Progress have been received from Charles F. H. Allen, R. H. Bullard, Henry Gilman, S. P. Mulliken, and M. L. Sherrill.

The papers listed below, which have been published since the last report of the Committee, describe the results of investigations aided by the Warren Fund. In each case there is an acknowledgment by the author of the assistance received.

Charles F. H. Allen and M. Philbrick Bridgess: "Addition Reactions of Vinyl Phenyl Ketone. I. Phenylnitromethane, J. A. C. S. 51, 2151 (1929).

Charles F. H. Allen and Ernest F. Herrmann: "The Bromination of Desylacetophenone," J. A. C. S. 51, 3591 (1929).

Ralph H. Bullard and Alfred C. Haussmann: "The Vapor Pressure of Some Stannanes," Journal of Physical Chemistry, Vol. XXXIV, pp. 743-747, April, 1930.

Ralph H. Bullard: "A Series Arrangement of Organic Groups. I. As Determined by the Halogenation of Mixed Stannanes," J. A. C. S. 51, 3065 (1929).

Henry Gilman, J. McGlumphy and R. E. Fothergill: "The Luminescence Resulting from Some Aryl-Magnesium Halides with Nitro Compounds." (Preprint of a paper to be published in the Rec. trav. Chim. in April or May of this year).

Carl L. A. Schmidt, W. K. Appleman, and Paul L. Kirk: "The Apparent Dissociation Constant of Tryptophane and of Histidine," The Journal of Biological Chemistry, Vol. LXXXV, No. 1, December, 1929.

J. Errera and M. L. Sherrill: "Dipolemoments and Molecular Constitution," Leipziger Vorträge, Page 41, 1929.

Arthur F. Scott and Clyde R. Johnson: "The Atomic Weight of Chlorine. The Ratio NOCl: Ag," Journal of Physical Chemistry, Vol. XXXIII, pp. 1975-1986, December, 1929.

JAMES F. NORRIS, *Chairman.*

May 14, 1930.

#### REPORT OF THE HOUSE COMMITTEE.

The House Committee has had funds at its disposal amounting to \$3,648.63, made up as follows:

Balance from previous year . . . . .	\$ 838.63
Appropriation for 1929-30 . . . . .	2,500.00
Received for use of rooms . . . . .	310.00

Of this amount, the sum of \$2,533.01 has been spent for the routine expenses, janitor, light, power, heat, telephone, etc., and \$277.85 has been spent for upkeep and equipment, making a total of \$2,810.86, and leaving an unexpended balance of \$837.77. The chief item of upkeep this year has been renovating and repairing the Reading Room chairs and other furniture. Our appropriation for the coming year includes a sum for painting the lecture hall and the staircase hall, which work we expect to have done this summer.

Meetings have been held as follows:

The Academy . . . . .	8
American Antiquarian Society . . . . .	1
Am. Chemical Society, Northeastern Section . . . . .	7
Archaeological Institute of America . . . . .	3
Harvard-Technology Chemical Club . . . . .	7
Japan Society of Boston . . . . .	2
Mediaeval Academy of America . . . . .	1
Musical Guild of Boston . . . . .	2
Needlework Guild, N. E. Labrador Branch . . . . .	1
New England Botanical Club . . . . .	9
Radcliffe Club of Boston . . . . .	1
Thursday Evening Club . . . . .	1
	—
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The Council Chamber had been used for Academy Council and Committee meetings, and also by the Trustees of the Children's Museum, the New England Farm and Garden Association, the Thursday Evening Club, etc.

A detailed list of expenditures follows:

Janitor . . . . .	\$ 986.00
Electricity { Light . . . . .	197.02
Power . . . . .	101.88
Coal . . . . .	896.90
Care of elevator . . . . .	73.79
Gas . . . . .	48.46
Water . . . . .	46.00
Telephone . . . . .	106.21
Ash tickets . . . . .	30.15
Upkeep . . . . .	256.25
Furnishing and equipment . . . . .	21.60
Janitor's supplies and sundries . . . . .	46.60
	—
Total expenditure . . . . .	\$2,810.86

S. B. WOLBACH, *Chairman.*

May 14, 1930.

Owing to the absence from the country of the Editor, no report of the Publication Committee was presented at this time.

It was *Voted*, To confirm the award of the Rumford Premium to Dr. John S. Plaskett, previously voted at the February meeting.

On the recommendation of the Treasurer, it was *Voted*, That the Annual Assessment for 1930-1931 be \$15.

The annual election resulted in the choice of the following officers and committees:

EDWIN B. WILSON, *President*.

HARRY M. GOODWIN, *Vice-President for Class I.*

GEORGE H. PARKER, *Vice-President for Class II.*

JEREMIAH D. M. FORD, *Vice-President for Class III.*

TENNEY L. DAVIS, *Corresponding Secretary.*

WALTER E. CLARK, *Recording Secretary.*

INGERSOLL BOWDITCH, *Treasurer.*

ALFRED C. LANE, *Librarian.*

HERBERT V. NEAL, *Editor.*

*Councillors for Four Years.*

CLARENCE L. E. MOORE, *of Class I.* HERVEY W. SHIMER, *of Class II*  
ALBERT C. KNUDSON, *of Class III.*

*Finance Committee.*

THOMAS BARBOUR

PAUL J. SACHS

FREDERICK P. FISH

*Rumford Committee.*

ARTHUR E. KENNELLY

ELIHU THOMSON

HARRY M. GOODWIN

HARLOW SHAPLEY

PERCY W. BRIDGMAN

CHARLES L. NORTON

NORTON A. KENT

*C. M. Warren Committee.*

JAMES F. NORRIS

GREGORY P. BAXTER

ARTHUR D. LITTLE

REID HUNT

WALTER L. JENNINGS

FREDERICK G. KEYES

CHARLES A. KRAUS

*Publication Committee.*

(Editor) HERBERT V. NEAL, *ex officio Chairman*  
EDWIN C. KEMBLE, *of Class I*      FREDERIC T. LEWIS, *of Class II*  
GEORGE F. MOORE, *of Class III*

*Library Committee.*

(Librarian) ALFRED C. LANE, *ex officio Chairman*  
RAYMOND C. ARCHIBALD, *of Class I*      THOMAS BARBOUR, *of Class II*  
WILLIAM C. LANE, *of Class III*

*House Committee.*

S. BURT WOLBACH, *Chairman*  
ROBERT P. BIGELOW      WILLIAM H. LAWRENCE

*Committee on Meetings.*

THE PRESIDENT  
THE RECORDING SECRETARY  
GEORGE H. PARKER    DANIEL F. COMSTOCK    WILLIAM C. GREENE

*Auditing Committee.*

GEORGE R. AGASSIZ      JOHN E. THAYER

The Corresponding Secretary reported that the following gentlemen had been elected members of the Academy by the Council:

## FELLOWS.

## CLASS I.

- Section 1. Philip Franklin, Belmont.  
Harry Hemley Plaskett, Cambridge.  
Dirk Jan Struik, Cambridge.
- Section 3. Lafayette Benedict Mendel, New Haven, Conn.  
Lyman Churchill Newell, Brookline.
- Section 4. Frank Baldwin Jewett, New York, N. Y.  
Greenleaf Whittier Pickard, Newton Center.  
George Edmond Russell, Arlington.

## CLASS II.

- Section 2.* LeRoy Abrams, Stanford University, Cal.  
Karl Sax, Boston.  
*Section 3.* Henry Clinton Fall, Tyngsboro.  
*Section 4.* David Cheever, Boston.  
Torald Hermann Sollmann, Cleveland, Ohio.  
Fritz Bradley Talbot, Brookline.

## CLASS III.

- Section 1.* Thomas Hovey Gage, Worcester.  
William Henry Paine Hatch, Cambridge.  
James Hugh Ryan, Washington, D. C.  
George Augustus Sanderson, Littleton.  
*Section 2.* James Geddes, Jr., Brookline.  
Ernest Hatch Wilkins, Oberlin, Ohio.  
*Section 4.* John Erskine, New York, N. Y.

## FOREIGN HONORARY MEMBERS.

## CLASS I.

- Section 3.* Archibald Byron Macallum, London, Ontario.

## CLASS II.

- Section 3.* Louis Édouard Lapicque, Paris.

## CLASS III.

- Section 2.* Sir Aurel Stein, Srinagar, Kashmir.  
*Section 4.* Alfredo Casella, Rome.

The following communication was presented:

Dr. William B. Castle: "The Etiology of Pernicious Anemia."

The following paper was presented by title: "Photographic Investigation of 24 Southern Cepheid Variable Stars," by Harlow Shapley.

The meeting was dissolved at 10.17 P. M.

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WILLIAM ROSENZWEIG ARNOLD<sup>1</sup> (1872-1929).

Fellow in Class III, Section 2, 1914.

William Rosenzweig Arnold was born of German parents, November 14, 1872, and died at his home in Cambridge on December 11, 1929.

He was taken as a very young boy to Jerusalem, and many of his boyish memories centered around the Holy City. Moving later to Egypt, he spent several years in Alexandria and came to America when he was about fourteen years of age. That he was not slow to learn is shown by the fact that after preparing for the Ohio Wesleyan University at Delaware, Ohio, he graduated from that institution in his twentieth year in 1892. His college course was followed by studies in Union Theological Seminary, from which he was graduated in 1895. During the college year 1895-96 he was University Fellow in Columbia University, where he was awarded his Ph.D in 1896. His thesis was entitled *Ancient-Babylonian Temple Records*. In the years 1896-98 he was Curator of the Department of Antiquities in the Metropolitan Museum of Art, New York. He could have continued in Museum work had he so wished, but he decided to turn to scholarly work of a somewhat different character.

On December 22, 1898, he married Ada Hinde Hart of New York, went abroad with his bride, and studied at both Halle and Oxford. Returning to America before the end of 1899, he continued his studies, a partial result of which appeared in "*The Composition of Nahum*," published in 1901.

With the beginning of his teaching at Andover Theological Seminary in 1902 as Lecturer on the Old Testament, he entered on his real life work. He brought to this work such natural abilities and such careful training that we are not surprised that in 1903 he was appointed Hitchcock Professor of the Hebrew Language and Literature, which title he retained until 1922. When Andover Seminary moved to Cambridge in 1908 he became also Andover Professor of the Hebrew Language and Literature in Harvard University (1908-1922). From 1922 until the time of his death he was Hancock Professor of Hebrew

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<sup>1</sup> Compare the minute prepared by the writer and read by him at the meeting of the Faculty of the Harvard Theological School, February 14, 1930, and printed in *The Harvard University Gazette*, March 1, 1930.

and other Oriental Languages in Harvard University. He was elected to the American Academy January 14, 1914. He was a member of the Society of Biblical Literature and Exegesis, and was elected President of that Society in 1922, his presidential address being "Observations on the Origins of Holy Scripture." Among his other writings are:—The Divine Name in Exodus iii, 14, 1905; The Rhythms of the Ancient Hebrews, 1908; The Passover Papyrus from Elephantine, 1912; Ephod and Ark, 1917; besides contributions to Oriental and Biblical journals.

While Professor Arnold's writings were of such a high type as to give him a place among the foremost Old Testament scholars of his time, probably his greatest work was done with his students, both inside and outside of the classroom. To this he brought a strong personality, a keen mind carefully trained, broad intellectual interests, and an unusual understanding of the niceties of Semitic speech and thought. These characteristics, united with a deeply religious nature, so essential for the understanding and interpretation of a great religious book like the Old Testament, and a warm heart that responded to any worthy appeal, made a deep impression on his students and on his colleagues, who learned to respect him for his rigorous scholarship, to rely on his judgment and insight, and to love him for his personal qualities.

JAMES R. JEWETT.

#### WILLIAM STURGIS BIGELOW (1850-1926).

Fellow in Class III, Section 4, 1911.

William Sturgis Bigelow, born in Boston April 4th, 1850, died in Boston October 5th, 1926. He was the son of the well known physician, Henry Jacob Bigelow, a founder of the Museum of Fine Arts and a trustee of the institution until his death; and the grandson of Dr. Jacob Bigelow, who was active in founding the Massachusetts Institute of Technology and delivered the address at the opening of its first building. To the scientific interests and public spirit derived from such an ancestry there was added a fine sensitivity of nature and susceptibility to spiritual values, which he inherited from his mother, the daughter of William Sturgis; she died

when he was a boy. Dr. Bigelow was graduated from Harvard College in 1871, and from the Harvard Medical School in 1874. After five years of study abroad, mainly with Louis Pasteur in France, he returned to Boston, to take up the practice of medicine, accepting appointments as Assistant in Surgery at the Harvard Medical School and Out-patient Surgeon at the Massachusetts General Hospital. It is said that Dr. Bigelow, gifted as he was in keenness of mind and deftness of hand, was unfitted by temperament for active practice. He gave up his professional work in 1881 and went to Japan, where he remained till 1888. Here he became deeply interested in Northern Buddhism. Devoting himself to the study of its doctrine, he took the education of a priest and became a regular member of the Tendal sect. One of his few published writings is the Ingersoll Lecture on Buddhism and Immortality, which he delivered at Harvard in 1908.

In Japan Dr. Bigelow came into touch with three Americans who were among the first foreigners to appreciate the significance of Japanese art, Ernest Fenollosa, Edward S. Morse, and Dr. Charles G. Weld. His rare taste and love of the beautiful quickly found satisfaction in the prints, the carvings, the lacquers, and especially the paintings that had come down from the great periods of art in Japan. The time was propitious for the collector. A new spirit, the spirit of Western civilization was abroad; for the moment the Japanese leaders of thought and of taste in great numbers forgot their heritage in enthusiasm for the customs and ideals and achievements of the West; to part with possessions of art which had been cherished in temples and noble families for many generations, no longer seemed a sacrilege. These treasures were offered for sale at prices ridiculously low, since there was no market demand for them. Of this opportunity Dr. Bigelow made free, even lavish use. His delight in Japanese art grew with his purchases, till in a few years he not only became a connoisseur but also gathered an enormous collection which will always remain a tribute to his vision and his taste. This collection was lent and later given to the Museum of Fine Arts. Its value in interpreting Japan to America was recognized by the Japanese government, which in 1909 decorated Dr. Bigelow with the Order of the Rising Sun with the rank of Commander.

Dr. Bigelow's other services to the Museum overshadowed the gift

of his collection. On the death of his father in 1891, he was elected to the position of trustee, which his father had held, and for thirty-five years he gave of his best to the institution. For more than half this time he served on the controlling committee, known as the Committee on the Museum. His fellow members came to respect more and more highly his shrewdness, his sound common sense, and his appreciation of art. Not a partisan in spite of strong convictions, of clear-cut purpose in matters of Museum policy, often relieving the tension of argument by a flash of humor, above all things sympathetic and considerate of the views of others, he ever held the esteem as well as the affection of his associates.

If not a connoisseur outside the Oriental field, Dr. Bigelow's interest and pleasure in all phases of art was unlimited. A Greek pottery vase, a Gothic carving, a Persian miniature, or again, a contemporary American painting, appealed to his catholic taste. Music, as well as the visual arts, gave him keen enjoyment. Generous by nature, his interest in young musicians and artists led him to assist real talent unobtrusively, as opportunity came to him, no one knows how often.

Dr. Bigelow had too high a standard of perfection in art and literature to be a writer or an artist himself. I have already said that his published writings were few. Some letters that I received from him I have preserved, though they dealt with questions of the moment, because they were so characteristic of the man. The literary form in a social or business letter, the glimpse of humor, the delicate grace of expression gave lasting value to what otherwise would have had only ephemeral interest. This habit of putting his best self into the little matters of daily life was characteristic of him.

Shy and sensitive by nature but well poised, generous, of warm sympathies, with keen and open mind, it is natural that Dr. Bigelow should have had a few intimate friends rather than very many friends. If evidence were needed of the many-sidedness of his character, it might be found in his friends, leaders in the business world and in the scientific world, leaders in political life like Lodge and Roosevelt, spiritual leaders as different as Phillips Brooks and Okakura-Kakuzo. To these he gave of himself, not only his views of life gathered in the East and in the West, but also a quick openness of mind and of comprehension which was most stimulating in conversation.

We have a tendency in these days to estimate a life in terms of things done. We rate the scientist by his discoveries, the physician by his professional success, the critic by his influence on the taste of his readers. With all his attainments in science, in medicine, and in the appreciation of art, Dr. Bigelow is not to be judged by this American standard of achievement. Perhaps it was the influence of the East that inspired his desire to become deeply acquainted with the world material and spiritual, rather than to leave his mark on it; his willingness to rest satisfied with the contemplation of the truth in science or in art; his effort to explore the possibilities of rich human living. Is it strange if such a character leads us sometimes to question our common standards of judgment? Is it strange if we admire one who understood the uses of leisure, leisure to think, to appreciate, to sympathize, to stimulate, leisure to create his own world in response to his spiritual needs?

Dr. Bigelow will be remembered, not so much for what he did, as for what he was.

ARTHUR FAIRBANKS.

#### WILLIAM HERBERT BIXBY (1849-1928).

Fellow in Class I, Section 4, 1912.

Abridged from a Memoir prepared by  
Herbert Deakyne, Brig.-Gen., U. S. Army, M. Am. Soc. C. E.,  
and published in the

Proceedings of the American Society of Civil Engineers,  
Part I—May, 1929, pp. 1324-1327.

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William Herbert Bixby, the son of Clark Smith and Elizabeth (Clark) Bixby, was born in Charlestown, Mass., on December 27, 1849. He was descended from Colonial stock, his forebears having served in the Colonial and Revolutionary Wars. He attended the public schools of Brookline and Cambridge, Mass., and then entered the Massachusetts Institute of Technology. After one year at the latter institution he was admitted in 1869 to the United States Military Academy at West Point, N. Y., from which he was graduated in 1873, at the head of his class and commissioned a Second Lieutenant in the Corps of Engineers, U. S. Army.

In 1879 he was sent on duty to Europe where he remained until 1882, attending the École Nationale des Ponts et Chaussées of France from which he was graduated with honor in 1881. Returning to the United States, he was placed on duty with the Engineer Battalion at Willets Point, where he remained until 1884. By this time he had reached the grade of Captain in the Corps of Engineers, and from 1884 to 1910, he served as Captain, Major, Lieutenant-Colonel, and Colonel, on river and harbor or lighthouse duty at Wilmington, N. C., Newport, R. I., and Philadelphia, Pa.; at Cincinnati, Ohio, in charge of the Ohio River System; on the Great Lakes at Detroit, Mich., and Chicago, Ill.; and at St. Louis, Mo., as President of the Mississippi River Commission. In 1910, he was appointed Brigadier-General, Chief of Engineers, and served in this capacity until his retirement from active service in 1913. On the entrance of the United States into the World War in 1917, General Bixby was recalled to active duty, and served until 1919 supervising the work of river and harbor improvement on the Mississippi River and its tributaries, in order to release officers on the active list for war service.

General Bixby was as active physically as mentally. As a young man he was an expert skater and, when on duty in France, took occasion during one winter to visit Holland in the hope of acquiring some of the refinements in the art. It developed, however, that his ability as a skater was already so great that he became a teacher rather than a student of the Hollanders. He found time while abroad for mountain climbing and ascended the Matterhorn with two guides. On another occasion he left Zermatt, Switzerland, about noon with one guide and ascended the Breithorn. Returning to the village about noon the next day they met a party starting out to make the ascent. They urged him so strongly to accompany them that he consented and reascended this mountain, getting back to the village about 4 P. M. of the following day, after more than 48 hours of continuous mountain climbing.

He was a man of simple tastes; there was nothing of the martinet about him. He loved the discussion of matters of professional interest and his tremendous fund of knowledge on military and civil engineering, and other scientific subjects, was a source of astonishment to those to whom it was displayed. He was one of the most generous and

kind-hearted of men, always thoughtful of the feelings and comfort of others, and most considerate in his dealings with them. His character was unimpeachable, and he leaves a record of service to his country unsullied by the slightest spot of selfish interest.

Deeply interested in scientific progress throughout his active life, General Bixby's interest in science and engineering continued undiminished to the end. In spite of advancing years, he was vigorous both in mind and body until stricken with his last illness when death stopped forever the strivings of his restless intelligence. He died in Washington, D. C., and after a simple service at his home his ashes were placed in the Arlington National Cemetery.

He was married on December 27, 1893, to Mrs. H. M. Jones, of Philadelphia, the widow of Lieut. H. M. Jones, 4th U. S. Artillery. Mrs. Bixby survives him.

E. H. HALL.

#### MAURICE BLOOMFIELD (1855-1928).

Fellow in Class III, Section 2, 1914.

Maurice Bloomfield was born in Bielitz, Austria, February 23, 1855, and died in San Francisco, California, June 13, 1928. His family moved to this country in his infancy, and he was educated in the public schools of Chicago, in the old University of Chicago (1871-4), in Furman University, Greenville, S. C. (1876-7), in Yale University (1877-8), in the Johns Hopkins University (Ph.D., 1879), and afterwards in the Universities of Leipzig and Berlin. In 1881 he was called to the chair of Sanskrit and Comparative Philology in Johns Hopkins, which he occupied until ill health compelled him to retire in 1926, when he became Professor Emeritus. He received the honorary degrees of LL.D from Princeton in 1906 and from Furman University in 1908, of L.H.D. from the University of Chicago in 1916, and of Doctor *honoris causa* from the University of Padua in 1922. He was elected a Fellow of the American Academy in May 1914. He was an Honorary Member of the Finno-Ugrian Society of Helsingfors, Foreign Member of the Czech Academy of Prague, and corporate member of numerous American and foreign learned societies. He had been President (1910-11) of the American Oriental Society.

He was recognized as one of the leading scholars of the world in both Indology and Indo-European Comparative Philology. To the science of linguistics he made contributions which passed into the realm of the commonplace in his own lifetime. The very term "haplology," as a designation of a now familiar linguistic process, was his invention. Similarly what is called linguistic contamination or blending is now a well-known concept, but much of its meaning is due to his development of the idea.

His originality and profundity are equally evident in his work in Indological studies. He ranks as one of the foremost Vedic scholars the world has produced. His *Vedic Concordance* (1906; *Harvard Oriental Series*, Volume 10) is a work of monumental industry and care, and the idea and plan of it show more than such pedestrian qualities; this book is one of the fundamental tools of Vedic research. At least as much may be said of his *Rigveda Repetitions* (1916; *Harvard Oriental Series*, Volumes 20 and 24). He was a particular specialist in the Atharva Veda, on which he wrote the standard reference-book (*The Atharva Veda*, 1899). Before this he had already published a translation of extensive selections of its most interesting materials (*Hymns of the Atharva-Veda*, 1897; *Sacred Books of the East*, Volume 42). He also, with Professor Garbe of Tübingen, prepared and published a photographic reproduction of the virtually unique manuscript of the text of another school-recension of the Atharva Veda (*The Kashmirian Atharva Veda*, 1901). His most important text-edition was *The Kauçika-Sutra of the Atharva-Veda* (1890). A highly valuable work, both to scholars and to wider circles, was his *Religion of the Veda* (1908). Besides these major *opera*, he contributed to Indic studies by very numerous articles in journals and collective publications, showing in all of them a remarkable combination of deep learning, scholarly imagination, and effective presentation. Special mention should be made of his extensive studies in the stock *motifs* of Hindu fiction, many of which he made the subject of detailed studies which are as fascinating as they are useful and illuminating; through them he developed the idea of an "Encyclopedia of Hindu Fiction-Motifs," which unhappily he never lived to complete, but on the continuation of which some of his pupils are working.

He was no less remarkable as a teacher than as a scholar, and

trained a striking number of younger scholars in Indological and linguistic studies. Few American philologists have made so deep an impression upon the scholarly world as he did.

FRANKLIN EDGERTON.

#### ARCHIBALD CARY COOLIDGE (1866-1928).

Fellow in Class III, Section 3, 1910.

Archibald Cary Coolidge was born in Boston in 1866, the third child of J. Randolph and Julia (Gardner) Coolidge. He was a great-great grandson of Thomas Jefferson. He prepared for Harvard at the Adams Academy in Quincy where he came under the influence of William Everett. Travel, begun under favorable conditions in early boyhood, fired his imagination with a strong desire to know more about foreign countries, and this desire conspired with family tradition and natural aptitude to lead him, while in college, to specialize in History and Government. He graduated *summa cum laude* in 1887. Pursuing the study of history further in France and Germany, he got his Ph.D. with von Holst at Freiburg in 1892. Meanwhile he had entered the diplomatic service; and his interest in history became focused on modern international relations by this experience. In 1890-91 he was Acting-Secretary to the American Legation in St. Petersburg; in 1892 he was private secretary to his uncle, then U. S. Minister to France, and in 1893 he was Secretary to the American Legation in Vienna. He returned to Cambridge in 1893 and from then till the time of his death (January 14, 1928), for six years as Instructor in History (1893-99), for nine years as Assistant Professor (1899-1908), for twenty years as Professor, and for eighteen years as Director of the University Library (1910-28), he served Harvard to the uttermost limit of his capacity. Three times he represented her abroad, in 1906-07 as Lecturer at the University of Paris and other French Universities, in 1908-09 as Delegate to the Pan-American Scientific Congress at Santiago in Chile, and in 1913-14 as Exchange Professor to the University of Berlin. During the last six years of his life (1922-28), besides being Professor of History and Director of the University Library, he was Editor of "*Foreign Affairs*."

He formed the ambition of putting Harvard as a school of History

on a par with the great schools of the old world; and, first as a means thereto and then as an end in itself, he undertook to appraise and augment the resources of the University Library. It is largely owing to his efforts that Harvard is able to offer instruction in the history of Latin America, of the Far East, of the Byzantine Empire and of the Slavic countries. His salient characteristics, as they manifested themselves in action to his colleagues in History, are described thus in the Departmental minutes: "He was a man who rose above his prejudices. Inheriting ample means, he felt it to be a national loss, and a reproach to men of wealth and social position, that they left the arduous pursuit of scholarship so largely to others; but he welcomed talent wherever he found it. He was too shrewd and kindly to mistake lack of *savoir faire* for lack of initiative. He gave himself to history; and it was characteristic of him that his gifts to the Department in his lifetime should take permanent form in his bequests. . . . One prejudice he did not rise above—a prejudice for intellectual distinction; but to him this was a thing of many kinds. . . . His attachments were of the heart. He was a man of strong feeling, quick to anger at injustice, profoundly stirred by sympathy. He hated the waste of useless friction and mis-directed strength . . . His mind was essentially political: he knew that he lived in a world of men, not of ideas. What he used to call a decent regard for the opinions of others made him seek counsel as well as give it. Behind the bold unexpectedness of his strokes there was ordinarily much cautious balancing of alternatives; and when he hesitated, it was not from vacillation."

Closely connected with Professor Coolidge's position as a member of the Faculty was his directorship of the University Library during the last eighteen years of his life. To him the Library was a great institution for teaching and research which stood in the closest relations with the daily work of faculty and students, and he labored alike for the fullest development of its collections and the widest opportunities for their use. He directed the details of library administration to an extent that few realized, but he never lost the larger view of the Library's functions and influence. Though much that he did was impersonal and unperceived, it affected none the less profoundly the whole intellectual life of the University. Professor Coolidge's services as Director of the Library have been summarized as follows by the

Library Council: "The first to hold this office, Professor Coolidge gave a creative interpretation to its functions and made it an essential part of the University organization. He kept before the University and its friends a broad and comprehensive idea of the Library and its possibilities, and had the satisfaction of seeing the Harvard Library under his administration reach an assured position among the great libraries of the world. This result was due in large measure to his own wisdom, vision, patient skill, and interest in every side of the Library's welfare. He encouraged equally the acquisition of unique special collections, the prompt and steady purchase of books asked for, and improved facilities for work by members of the University and by visiting scholars. His own unfailing generosity stimulated the generosity of other donors, and his devotion called forth devotion and loyalty on the part of the entire Library staff. Professor Coolidge was an ideal Library Director, and did a unique and enduring work for scholarship and education. His associates in the Library bear him in deep and lasting affection."

Professor Coolidge was a Syndic of the Harvard University Press for the last thirteen years of his life, and he conceived this office positively, as laying on him an obligation to aid in the production of worthy books. While he was more fruitful as an inspirer of the writing of others than as a writer himself, he yet found time to publish certain works of real importance. His Freiburg dissertation on "*Theoretical and Foreign Elements in the Formation of the American Constitution*" was not followed up, as it did not represent his more permanent interests. These came out clearly in 1908 in his volume on "*The United States as a World Power*," first prepared in the form of lectures at the Sorbonne. Translated into French, German, and Japanese, this met with an instantaneous response in foreign countries, and as time went on its importance was increasingly realized by American readers because of its timely and suggestive presentation of America's place in the world's affairs. In 1917 he published a brief volume on "*The Origins of the Triple Alliance*" (revised edition in 1926), and in 1920-21 he acted as the English editor of "*The Secret Treaties of Austria-Hungary*." His latest publication, "*Ten Years of War and Peace*" (1927), gathered together the results of his ripest reflections on problems of world politics, many of them by-products of his editorship of "*Foreign*

*Affairs.*" The quality of his writing is evidenced by the comment of President Poincaré on his last published work, an article in the October issue of this journal entitled, "*A Quarter Century of Franco-British Relations:*" "The emphasis is absolutely perfect. No Frenchman or Englishman could possibly have done it. It could only have been written by a thorough master of the subject who could approach it from a completely unprejudiced point of view. It seems indeed the perfect type of historical writing."

In the many years of academic life which followed his brief initiation in diplomacy, he kept in touch with the State Department in his own country and with the leaders in foreign affairs in many countries abroad. He trained distinguished diplomats for our own service, and by repeated travels in Europe, Africa, Asia, and South America, he continued to learn at first hand the problems with which his disciples had to deal. His knowledge of foreign relations grew steadily more intimate and more extensive; he knew not only the history of the nice details of diplomatic negotiations, but he knew also, what diplomatists sometimes ignore, how to appraise the movement of public opinion and to evaluate the great factors of national sentiment, economic motives, and religious enthusiasm. The minds of the diverse breeds of men, from Berbers to Britons, were not alien to him.

During the Great War he was active among the American scholars who were gathering material for use at the Peace Settlement, and the State Department gave him a mission to accompany the fruitless Archangel expedition (1918). As a member of the American staff of the Peace Conference at Paris he was sent for some months to Vienna (1919), where in the most shattered region of Europe he displayed his remarkable capacity for constructive work. In 1921-22, his exceptional knowledge of Russian affairs led to his being attached to the American mission for the relief of starving Russia.

The opportunity, however, for the exercise of a rare combination of wide-ranging and penetrating knowledge with unusual practical sagacity came, in a measure, through the call from the Council on Foreign Relations for the conduct of its journal, "*Foreign Affairs.*" He gave to the journal from its beginning a quality embodying his own insight and catholicity of temper, which assured its influence and reputation. He felt the responsibility of editorship and met its de-

mands with unflagging zeal. Heavy as was the burden, it was carried with apparent ease and with extraordinary competence, so readily were the resources of a strong nature and a trained mind brought to bear upon the new enterprise. It was a happy conjunction, fortunate for the Council on Foreign Relations and not unfruitful for the editor himself; for it enabled him, through "*Foreign Affairs*," to discuss in print the things for which he most cared.

In another period or in another country than his own, Professor Coolidge might have been, it is easy to imagine, a great statesman as minister for foreign affairs. As it was, he put the stamp of statesman-like greatness on all he did, whether in services abroad, in his library administration, or in preparing scholars and public officials for the needs of the next generation. All these aspects of his work hang together, and they are given deeper unity by his supreme quality of statesmanship.

W. S. FERGUSON,  
C. H. HASKINS.  
E. F. GAY,  
R. B. MERRIMAN, *Committee.*

Minute for the Records of the Harvard Faculty of Arts and Sciences.  
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See also The Harvard Graduates' Magazine, June 1928.

#### WILLIAM OTIS CROSBY (1850-1925).

Fellow in Class II, Section 1, 1881.

Professor William Otis Crosby was for fifty-four years connected with The Massachusetts Institute of Technology. From its beginning he was a Fellow of the Geological Society of America, in whose Bulletin<sup>1</sup> appeared a memorial prepared by his colleagues A. W. Shimer and W. Lindgren. To this reference should be made for a more detailed account of his work. It remains for this memoir to supplement it and emphasize certain salient points. In this I have had invaluable assistance from his wife and from his classmate, John R. Freeman.

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<sup>1</sup> Bulletin Geological Society of America, Vol. 38, 1926, Pl. 2, pp. 34-45.

And first, as genealogy is but the last chapter of geology, it is well to begin with that. His ancestral line goes back to Timothy Crosby, born in Litchfield, in 1761. This Timothy was a turner by trade, an ingenious Yankee who not only made furniture but wheels, ploughs and other implements. He was William Otis' great grandfather, an industrious man and a strict Presbyterian. His wife was Cornelia Libbey, whose father, an Englishman, was a man of ability and education.

Henry Libbey Crosby, their first child and grandfather of William Otis, was born in Stillwater, N. Y., in 1788. He was a man of high principles and great resourcefulness. He followed farming a part of his life, but for a number of years was connected with Union College, Schenectady, N. Y. as demonstrator in physics. When about forty-five he became a vegetarian partly for his health but also from humanitarian motives. Unlike his father, he was a free-thinker—as unorthodox people were called at that time. He lived to be 89. His wife was Sarah Ann Capron whose grandfather came from England about 1750 and settled in New London, Conn. The family tradition is that he was a surveyor. It is known that he was in the employ of the British government and was much away from home. He remained a Tory while all his family were patriots. His only son, Jeremiah, great-grandfather to William Otis, enlisted in the Continental Army when he was under fifteen, having gained his mother's consent, and came to Boston "to help Gen. Warren drive out the redcoats." His father ordered him home and promised to buy him a commission in the British Army if he would give up his allegiance to the Continentals, but the boy remained firm and was in the Army seven years, taking part in many battles, the first being Bunker Hill. He saw the surrender at Yorktown.

Francis William Crosby, son of Henry Libbey and Sarah Ann Capron and father of William Otis, born Schenectady, N. Y., 1823, was a teacher during his early manhood, later a bridge builder and after the Civil War was engaged in mining. He served four years in the Federal Army with the rank of Captain and Regimental Quartermaster. He marched with Sherman to the sea and then from Savannah north. On that march north he became interested in mining prospects and after the war went to North Carolina as superintendent of a

gold mine. This was followed by mining work in Colorado and finally, in 1875, he became superintendent of a gold mine in Venezuela. During the latter part of his long life he travelled much abroad and his letters were mixtures of delightful humor and vivid descriptions. He died in Washington in 1909 at the age of 86. He made extensive collections for the Smithsonian Institution while travelling in Europe.

W. O. Crosby's mother was Hannah Everett Ballard. Through her father, Frederick (Vermont) the line goes back with alternating Johns and Sherebias to William Ballard who came from Southwell, England, on the ship "James" in 1635 and settled in Attleboro, Mass. They were men of some importance in their home towns and more than one of them was a pioneer in a new settlement.

Achsah Everett, wife of Frederick Ballard, was the maternal grandmother of William Otis and was a cousin of Edward Everett.

Through different lines the ancestry of both Achsah and Edward goes back to Richard Everett who came from England in 1636 and was the founder of Dedham.

Crosby was born in a log cabin on the banks of the Ohio River, where his father, of deep anti-slavery convictions, had settled down as a school teacher, while by night he maintained a station in the "Underground Railroad" helping fugitive slaves to find their way toward Canada. From his father he derived his own deep convictions about the sacredness of life, and the wrong of needless killing, along with his fondness of acquisition of knowledge and love for the hills. When William Otis was five (in 1855) the family moved to Cincinnati by houseboat and a year or two later they went by river steamers to Iowa, settling in the little town of Toledo. Here Otis, the name he was called by, received his education in the common schools. Cousins who attended the same school with him say that he was usually one of the best in the class and that he was "a wonder in mathematics."

When he was eleven his father went into the army and during the next four years, Otis was the man of the house being the oldest of four children. Times were hard and much hard work fell to his lot even though his health was not robust. But swimming, in which he was proficient, skating, nutting and other simple recreations helped to keep him fairly well. He played endless games of chess with one of his teachers, finding special satisfaction in winning his share.

When sixteen, he went to South Carolina to be with his father in mining, later had two years in the Pension Bureau in Washington as Government clerk and in the spring of 1871 went to Colorado with his father. A journal he kept shows an enthusiastic appreciation of the grand and beautiful in nature and energy in the pursuit of either natural beauty or science. While crossing the plains on this trip, they saw many herds of wild buffalo, not less than 15,000 he estimated, and the bones of many more. He predicted then that the wild buffalo would be exterminated soon.

It was in the early part of this summer while tramping in the Rockies and often spending nights in the open, carried away by the glory of the sunrise from their summits—"worth crossing a continent to see" that exposure and fatigue resulted in a severe cold which laid the foundation of his deafness, a lifelong handicap. For a considerable period during the summer he and his father were working on a smelting furnace of their own invention in Upper Empire and boarding in Lower Empire fourteen hundred feet lower down. Daily they made the climb and descent putting in a long day of hard work between.

Crosby was older than most when he entered Tech. His first knowledge of the Institute and its opportunities came when Professor Richards about 55 years ago organized one of the earliest group excursions of the Institute students in mining engineering to inspect mining operations and visited Georgetown district in Colorado.

Upon Professor Richards making inquiry among local mining men for some young fellow who knew the country to act as their guide and assistant in their excursions, he was told: "Young Crosby is the best you can find. He has tramped everywhere over these hills, has been in all the mines and knows pretty much everything worth while that is going on."

Crosby at that time was about 21 years old, was helping his father operate a small quartz mill near Georgetown and was accustomed to manual labor about a mill and mine. With his father he had previous experience in mining and prospecting in the North Carolina gold fields.

While piloting this party of Professor and students, one of whom was J. R. Freeman, Crosby's ambition to become a student at Tech was aroused, and he quizzed students and instructors about its courses and requirements, even more diligently than they quizzed him about

the mines and minerals of the district. On July 27th, the entire party, Otis with them, made the ascent of Gray's Peak 14,500 feet. This was the second ascent of this lofty mountain for him, as he and his father had made the trip a short time before visiting both peaks and spending two nights near the summit. The Technology party camped at a cabin near an old mine part way up, but Otis had decided that he would spend the night on the Summit. When he announced his intention, seven of the students volunteered to join him. They reached the top at 10.30 P. M. and found such a gale of wind that they could barely keep on their feet. They built up a barrier of rocks and lay down in their blankets behind it, but could not sleep. In the morning the fierce wind was still blowing and they watched a gorgeous sunrise by lying prostrate on the rocks. "The sunrise was as grand as the previous night had been terrible, it surpassed anything of the kind I ever witnessed." His companions all declared they would not have missed it if it had cost twice as much. Many meteors fell that night, some of them leaving magnificent trails behind them. The blankets of these eight were covered with frost in the morning. They started down soon after welcoming the remainder of the party on top.

It was not until the middle of November that Otis arrived in Boston and entered the Institute. The following year he spent in Colorado again working with his father, but returned in 1873 and continued through his course without further interruption. During the summer he was with Agassiz at Penikese.

Early in January 1878, he went to Port of Spain, Trinidad, to meet his father who had been very ill with yellow fever at Caratal, Venezuela, and had barely escaped with his life. They spent two months cruising about in those tropical waters or camping on the island of Trinidad.

This was a new and wonderful experience for him. The vegetation, the marine life and the people interested him tremendously. His father lost a brother and a nephew with the fever at Caratal. The trip down was made on a small steamer, the return trip by schooner.

In the spring of '82 an interesting trip to Baracoa, Cuba, was made, the American Consul at that Port having engaged him to prospect for ore. This afforded great opportunities for geological investigation. The trip both ways was by sailing vessel.

Six months in Europe in 1883 when he not only took in all the museums had to offer, but did much field exploration in out of the way places such as the Lipari Islands, gave him experience that was of value to him all his life. When he first came to the Institute of Technology, T. Sterry Hunt was in charge, and he got from him certain erroneous ideas as to the sedimentary origin of felsites, and the possibility of dividing the Pre-cambrian stratigraphically by lithology which show in the nomenclature of his earlier work, but as he told me, a visit to Lipari, from which he gave me a fine specimen of liparite, cleared up his mind on many points, especially on the igneous origin of felsites.

His mind was stored with beautiful poetry so that line of poetry appropriate to the surroundings came to his lips naturally. And in the automobile, or where his deafness marred conversation, he might pass the time by intoning to himself in a low voice lines of poetry.

"The writer," says Freeman, "well remembers him from the first day that he joined the class. His strong face, deeply tanned by exposure, and the earnestness with which he was pursuing knowledge, which some of us were apparently trying to find means to escape, quickly singled him out, and impressed members of the faculty and of the class as out of the ordinary. By the time of graduation, I believe that his classmates would have joined in an expression of belief that he knew more of geology and perhaps more of chemistry than all of the rest of the class combined.

"After graduation, he remained intensely loyal to the class, and interested in all that pertained to the occupations and successes of its members, and in that way your class secretary maintained a considerable degree of intimacy and kept alive the friendship of student days."

"The writer many years ago became impressed with the possibilities of use of a trained geologist in helping a consulting engineer to more complete and accurate knowledge of conditions underground; and when he became a member of the original Metropolitan Water Commission in Boston in 1895, he brought about the appointment of Professor Crosby as consulting geologist to the engineers of the Board. Crosby was set at work studying foundations for the Wachusett Dam, the North Dike and conditions along the route of the aqueduct tunnel. There were some particularly puzzling problems as to the formations

at the dam sites and the possibilities of deep leakage through pre-glacial gorges filled with sand and gravel. Nothing had been said about salary, and when his first account for services was rendered, it came in at the surprisingly small per diem of \$10. per day. Upon remonstrating that this was hardly worth the dignity of a Tech professor, his characteristic reply was that he found so many interesting geological problems scattered all along the line that he wanted to spend so much time studying them, that he thought it best to make his per diem small."

Crosby said in later years, that it was Freeman who had dragged him from the professor's chair and workshop into his pleasant contacts with construction engineering. Freeman sought his advice on many problems of dams, reservoirs and foundations and advised others to seek his skill in such investigations; and testifies "that he never found another whose advice was so careful and painstaking in exploring the landscape thoroughly for miles around, before rendering his verdict. While he quickly came to understand the great aid that a geologist could give an engineer, he also found that to get this information in most useful form, it was always better to personally take the geologist into the field and cross question him on the spot, and insist on answers in the language of engineers, lest he write an essay dealing more with historic geology, than with what an engineer should do to be safe.

"Sometimes patience was sorely taxed while waiting for an answer, while the geologist, hammer in hand, climbed the rocks and wandered many miles afield, but when the answer came it always was found based on such thoroughness and with such clear cut reasoning that it carried conviction."

"It was on the result of about two months of most painstaking field work by Crosby that the writer felt justified in recommending the flooding of the Big Meadows District in California, 40 square miles in area, over old lava beds, and with the assurance that it would hold water after a high dam was built. It was Crosby to whom the writer turned when seeking the best dam site on the Medina River in Texas, in a region abounding in giant springs, and trying to make sure before advising expenditure of perhaps a million dollars in a big dam, that the water would not disappear into some underground cavern in the region of the great Barcones fault.

"It was Crosby whom the writer recommended as the most competent man that could be found anywhere for puzzling out questions of the tightness of the reservoir on the Conchos River in Mexico; Crosby to whom the writer turned for tracing the possible leaks in the limestone formation beneath the Hales Bar Dam on the Tennessee River; and again it was Crosby on whom we relied as to the excellence of the foundations afforded by the limestone ledge on which the great dam across the Mississippi River at Keokuk now stands. He traced out the reasons for this remarkable exposure of bed rock at Keokuk, by showing how the Mississippi, ages ago had been pushed out from its original deeper and broader bed to the eastward along a few miles of its course by a great glacier coming down from the northwest, so that it had cut a new and relatively short channel over a broad spur of ledge. It was Crosby on whom we relied for explanation of a most difficult dam site on the Missouri River at Holter, where the great dam now stands, and where two faults appeared to have joined forces immediately underneath the best location for a high dam.

"It was largely on Crosby's studies that the underground conditions for obtaining water supply from the deep gravels in the terminal moraine on Long Island were worked out for the New York Board of Water Supply; and again it was Crosby who first of all worked out the problems of underground formations along the line of the Catskill aqueduct, and who saved his professional fee many times over by the skill with which he pointed out where the fewest diamond drill borings or wash borings, would give the maximum of information at smallest cost.

"The Director of the U. S. Geological Survey told the writer a few years ago that Crosby had become probably the best advisor to be found in the United States upon geological conditions at a dam site presenting difficult foundations.

"His reports were models of clarity and skill in the use of the English language; and I recall that the late Professor Sedgewick, who himself was one of the best that ever lectured at Tech, told me once of lingering just outside the door of Crosby's lecture room, fascinated by this literary quality.

"Together Crosby and I studied mining prospects in Alaska, in Colorado and on the borders of Death Valley, and thus I came to

know Crosby's joy in his work, his kindness of heart, and the keen sense of humor that many did not suspect."

The bibliographic list of the Geological Society memoir does not indicate all of some 109 professional reports, though they all contain interesting geological matter, and an unknown number were printed. When the printing occurred in periodicals as official reports, the Geological Society of America list includes them, but they were also sometimes issued as small pamphlets, e. g. in 1880, one on the Naraguagua Mine, Washington County, Maine, and on the Pembroke Mine, and, in 1896, one on the serpentine marbles of Westfield, Mass.

The outstanding features of his scientific work were these:

He was one of the first geologists, if not the first, to be regularly employed in helping the civil engineer to a more complete and accurate knowledge of underground conditions, such as were encountered in large waterwork propositions, building the largest dry dock in America, and various large dams. This gave him access to and led him to look over large series of borings and thus to studies not only of detailed geology, but of more general interest: such as those showing that much of the clay of till is "rock flour," studies of eskers and other forms of glacial deposits.

His as yet unsurpassed and irreplaceable studies of the rocks around Boston led him to consider jointing as due to earthquake shocks on rocks under strain, and the importance of "keystone faults." His work on the granites around Boston and the Black Hills of Dakota led him to views as to the aqueo-igneous character of pegmatites, intermediate between dikes and veins, which were in advance of his time.

While his deafness hampered his work as a teacher and naturally led him to wait for the other man to speak first, he was most kindly in all relations.

ALFRED C. LANE.

#### PLINY EARLE GODDARD (1869-1928).

Fellow in Class III, Section 2, 1919.

In the death of Pliny Earle Goddard, which occurred July 13th, 1928, anthropology lost a keen and able investigator and his colleagues and friends a vivid personality, ardent, fearless and loyal.

Born of Quaker parentage in Lewistown, Maine, November 24th, 1869, he spent his early boyhood at Durham where his father was the Friend minister. He attended school first at Vassalboro and then at the Oakwood Seminary at Union Springs, New York, and then entered Earlham College, Indiana where he graduated in 1892. For the next few years he taught school at various places in Indiana and Kansas, having married in 1893 Alice Rockwell of Palmyra, Michigan. Becoming interested in the American Indian, he went in 1897 to the Hoopa Reservation, California, as lay missionary for an inter-denominational organization in Philadelphia. Here his interest in the Indians, already aroused, rapidly deepened, and he set himself the task of making a thorough study of the life and language of this still largely unspoiled tribe. As his work progressed, he resolved if possible to devote his life to ethnological studies. He was entirely without means, without professional training and had a wife and two young children to support. His courage did not desert him, however, and in 1900 his wife and children having returned for a time to her parents, he entered the University of California as a graduate student of linguistics under President Wheeler. In 1901 the Department of Anthropology was organized at the University, and Goddard received an appointment as instructor. His wife and children now rejoined him, and with a salary on which he could live without the constant grind of his previous poverty, he continued his studies, received his doctorate in 1904 and two years later was made Assistant Professor. Field work, at first in California and later in the Southwest among tribes related linguistically to the Hupa, among whom he had made his first studies; the preparation and publication of numerous monographs and papers containing the results of his work; and teaching in the University, took up his time.

In 1909 Goddard rather regretfully left Berkeley for the American Museum of Natural History in New York, where he was appointed to an Assistant Curatorship. Within a few years he was promoted to Curator of Ethnology. In his new position his interest turned to specimens and collections, and he became absorbed in rearranging and installing many of the collections under his charge. As an outcome of this work, he prepared and published several admirable handbooks on the Indians of particular regions, such as the Southwest and

the Northwest Coast. From 1915 to 1920 Goddard was Editor of the American Anthropologist, and was co-editor and founder with Boas of the International Journal of American Linguistics. From 1915 on he was Lecturer in Anthropology at Columbia University, and at various times held office in all of the various scientific societies and associations in his field.

Goddard's published scientific work lay largely in the Athabascan field, and included studies of the culture, myths and language of many tribes belonging to this widely extended stock. His "Life and Culture of the Hupa," was the first fruit of his years of study with this tribe, and is a brilliant and sympathetic account which at once attracted attention. He followed this by a series of monographs on the Hupa language. His later works dealt with other Athabascan tribes in California, with the Navaho and Apache and with the Sarsi, Chipe-wyan and Beaver, Athabascan tribes of the Canadian Northwest. His minor papers covered a wide range of topics.

Personally Goddard was a man not easily forgotten. In manner sometimes shy, to his friends he revealed a deep affection, a wit keen and biting, a courage and boundless enthusiasm which endeared him. He felt strongly, spoke fearlessly and so sometimes made enemies. His passing leaves a gap that cannot easily be filled.

ROLAND B. DIXON.

#### GEORGE WASHINGTON GOETHALS (1858-1928).

Fellow in Class I, Section 4, 1912.

George Washington Goethals was born in Brooklyn, New York, on June 29th, 1858, of Dutch stock from which he inherited a very great tenacity of purpose. His early education was that of the average American boy in a large city. From 1873-1876, he attended the College of the City of New York, after which he was appointed to the U. S. Military Academy at West Point where he graduated with a fine record in 1880. In June of the same year he was appointed second lieutenant of Engineers. From 1885-1887, he was assistant professor of military engineering at West Point. His early work included the construction at the lock and dams of Muscle Shoals on the Tennessee River. During the Spanish War, he was chief of

engineers of the U. S. Volunteers and in 1903 he became a member of the general staff. Promotion was so slow that he did not reach the grade of colonel until 1909 at the age of fifty-one, about two years after he had been detailed to Panama. In March, 1915, he was made major general largely on account of work on the Canal and in November, 1916, at the age of sixty, retired voluntarily after having served with distinction in the Great War. It is not necessary here to go into the details of his service, except to say that he always worked with a fearless sense of duty and that efficiency which led Secretary Taft to recommend him to the President for appointment to Panama.

His greatest service to the country was undoubtedly the completion of the Panama Canal begun under two civilian engineers who had followed each other for short terms. It was not the failure of these engineers that gave Goethals his opportunity, but the failure of the system set up by Act of Congress. John Stevens, having established the organization and plan for prosecuting the work of digging and moving dirt, found himself so hedged about by red tape under a commission resident in Washington that he offered his resignation, which was immediately accepted by the Secretary of War. Some years later, General Goethals said that the American people would never do justice to John Stevens in relation to the Canal.

It is said that President Roosevelt determined to send someone to Panama who could not resign. To succeed Stevens in 1907, he selected Lt. Col. G. W. Goethals as an army engineer for service on the Canal and ordered him to Panama. His first year was so disheartening that he was ready to come home. Senator Blackburn, of Kentucky, then civil governor of the Canal Zone showed the President the weakness of an organization which charged a chief engineer with responsibility for the work and permitted him to do nothing without the vote of a commission, resident on the Isthmus. Mr. Roosevelt promptly issued an order placing Goethals in real charge and making the commission his lieutenants. Thus he was able to carry the job through in record time although Roosevelt probably violated an Act of Congress in his order, determined as he was to have the Canal finished, as the American people so evidently desired. In 1914, as the Canal was approaching completion, Mr. Wilson appointed General Goethals governor of the Canal Zone, but the general had no great

interest in what he considered more or less of a sinecure. Operation as against construction had no attraction for him.

One of the first positions offered him when he returned to New York was commissioner of police, which he refused because he could not have full authority over the police. He had no patience with responsibility without power and very little faith in popular guidance of executive affairs. His fearless independence was well shown in connection with the Emergency Fleet Corporation in 1917. President Wilson appointed him manager and he accepted with reluctance, serving only three months. There was too much interference by the American Federation of Labor and, besides, he did not believe in one of his principal jobs, the building of a large number of wooden ships.

At the close of 1917, he was appointed acting quartermaster general and became chief of the division of purchase, storage and traffic. After the war was over, he opened an office in New York where as consultant, he undertook the examination of engineering projects. And there he died on January 21st, 1928, in full vigor, one of the great engineers of his country. Sensitive and overmodest, he invariably did his duty without fear.

IRA NELSON HOLLIS.

#### GEORGE ANGIER GORDON (1853-1929).

Fellow in Class III, Section 1, 1914.

The story of George Gordon's life is one of the remances in which American history abounds. He was born on January 2, 1853, in Aberdeenshire, Scotland; his father being grieve, or overseer, of the estate of Pitodrie; an efficient farmer, and an upright and rigid Calvinist. His mother, Catherine Hutchinson, was also of sturdy peasant stock, being one of eight children of a farmer-overseer. Thus the boy's early training was in the furrows of the farm and in the elementary discipline of the village school. "Poverty, toil, and hardship," the son later wrote, "bound us together in truest and happiest friendship." In 1871, at the age of eighteen, the son emigrated with his sister, in the steerage, to the United States, and, after a miserable

voyage, landed in Quebec, and travelled without food to Boston, where he found occupation, first in a safe-factory, and then as a house-painter and glazier; subsisting as a rule on two meagre meals a day.

His inherited concern for religious association led him to connect himself with a Presbyterian church in South Boston, and its pastor, Rev. Luther H. Angier, perceiving in the youth much promise, promoted his education, encouraged his interest in the ministry, and finally, in 1874, procured his admission to the Bangor Theological Seminary, where evidence of character rather than academic proficiency was accepted as a requirement. In 1877, while still at the Seminary, he was ordained to the ministry at a little village church in Temple, New Hampshire, and a year later applied for admission to Harvard College. He was so lacking in preparatory studies that he could not be enrolled in the entering class, but was, with some reluctance on the part of certain members of the faculty, admitted as a special student. Soon, however, he gave full proof of his ability, and graduated with the class of 1881 with a *magna cum laude* degree and honors in philosophy, winning from Professor W. W. Goodwin the estimate that Gordon was the best student of Plato and Aristotle he had ever had. During his college years he lived with the devoted friends who had in effect adopted him, and later, when their ward was established in pastoral life, Mr. and Mrs. Angier lived with him, and, as a mark of filial gratitude, their name was inserted by him in his own, and he became known as George Angier Gordon.

Immediately after Gordon's graduation he was called to the pastorate of the Second Congregational Church in Greenwich, Connecticut, where for the first time he came into association with prosperous people, and so completely won their regard that a call from the Old South Church in Boston in 1883 was successfully resisted by them. In 1884 the call was renewed and was accepted; though his convictions startled some of his conservative brethren, and his installation council was the scene of an animated contest. From this point, Gordon's career was of continuous and increasing distinction. He not only soon became the representative of evangelical liberalism in Boston, but before long became recognized as the most forceful and convincing preacher in American Protestantism. For forty-five years the Old

South Church was thronged with worshippers, and his retirement, in 1928, seemed an irreparable loss to liberal Christianity.

A long series of published volumes<sup>1</sup> indicates the range and depth of his teaching, and these works were succeeded, in 1925, by a frank and intimate autobiography under the title "My Education and Religion" (1925).

In addition to pastoral duties, many public causes and official obligations claimed Gordon's attention. He was appointed on the first Board of University Preachers at Harvard in 1886-1890, and served again in 1906-1909. He was Ingersoll lecturer at Harvard in 1897; Lyman Beecher lecturer at Yale in 1901, and Preacher at the Summer School of Theology in Mansfield College, Oxford, in 1894. He was four times elected a member of the Board of Overseers of Harvard University, serving from 1897 to 1909, from 1910 to 1916, and from 1925 to the date of his death. He received the honorary degree of D.D. from Bowdoin, Yale, Harvard, Columbia, Brown, and Williams; and that of LL.D. from Western Reserve and Boston Universities.

In 1896 he married Miss Susan Huntington Manning, the daughter of Gordon's predecessor as minister of the Old South Church, and she with one daughter, whose intellectual gifts were a joy to her father, survive him. He died in Brookline, Massachusetts, on October 25, 1929, in his seventy-seventh year.

This brief survey is sufficient to indicate the development of Dr. Gordon's career. It was in many aspects quite unlike that of most parish ministers. Instead of being submerged by parochial obligations and visitations, and at the service of every municipal and

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<sup>1</sup> The Witness to Immortality in Literature, Philosophy, and Life (1893).  
The Christ of Today (1895).

Immortality and the New Theodicy (1897) (Ingersoll Lecture).

The New Epoch for Faith (1901).

Ultimate Conceptions of Faith (1903).

Through Man to God (1906).

Religion and Miracle (1909).

Revelation and the Ideal (1913).

Aspects of the Infinite Mystery (1916).

Humanism in New England Theology (1920).

Also many sermons, addresses, and minor publications in pamphlet form.

philanthropic undertaking, Gordon gave his concentrated and continuous devotion to the special function of preaching, in unremitting obedience to the apostolic maxim, "This one thing I do!" He was by habit and inclination a recluse, deliberately dedicating his morning hours to study, and holding himself as a rule inaccessible to the casual visitors who unsparingly invade a minister's working hours with their incidental appeals. When emergencies summoned him from this seclusion he was a rock of defence for the cause which he maintained, and a profound interpreter of personal experience. No one could be more sustaining to sorrow, or commanding in eloquence. His plan of life was, however, definitely designed to promote his special gift, and the intellectual and spiritual preparation for that calling was his daily discipline and joy. The volumes which came in swift succession from his pen were, with few exceptions, by-products of his preaching or material for his work at weekday meetings. His untiring study of philosophy, and especially of Aristotle, gave to his sermons the stability and elevation of a mind in daily converse with great masters. It became clearer with each year that he was concerned with a fundamental change in religious thought, and a new conception of redemption, or what he called, in the volume which he regarded as his best, "Ultimate conceptions of Faith." The professional triumph of his ministry was therefore in reaching such a mastery of majestic truths that he could preach them to his people with vivacity and charm, rather than with the dullness of erudition. No American preacher since Bushnell has so boldly dared to make profound themes the material of parish sermons, and the throng of listeners which filled the Old South Church each Sunday morning was convincing evidence that a preacher of insight and grasp need not fear to instruct his people as well as to exhort them, and to apply serious thinking to homiletical service.

The personal character of Dr. Gordon was in the highest degree noble and winning. He was a delightful companion to those who were admitted to his intimacy. He had inherited the hardy constitution and the unyielding temperament of his Scotch ancestors, and with these a gift of humor which gave even to controversy a light and playful touch. His literary idol was Robert Burns, who, Gordon jestingly insisted, had more to teach than Shakespeare. He was the most

generous and sympathetic of friends, and no less the vigorous and unsparing critic of men who seemed to him mischievous, and of measures which seemed to him ill-advised. No preacher of his generation has done more to justify the calling of the ministry or to illustrate the legitimate function of a Christian Church.

FRANCIS G. PEABODY.

#### OKAKURA-KAKUZO (1862-1913).

Fellow in Class III, Section 4, 1913.

Okakura-Kakuzo was born at Fukui, the capital of Echizen Province, Japan. His father was a *samurai* who, feeling a deep interest in developing the trade of his country, obtained permission to relinquish his rank and devote himself to mercantile affairs in Tokyo and Yokohama,—a pursuit in which he was able to amass a comfortable fortune. Under such circumstances Okakura-Kakuzo received his early education, and while still very young, entered the Department of Literature in the Imperial University of Tokyo. Here he employed much of his time in the study of English and Chinese, and in 1880, at the age of eighteen, he graduated with the degree of A.M. and with honors in Philosophy and English Literature.

While a student at the University he came into intimate contact with the late Prof. Ernest F. Fenollosa, who was then lecturing there, and under whose stimulating influence Mr. Okakura's attention was, perhaps, first turned to the field of endeavor in which he afterward attained such distinction. From Fenollosa he received many of his early impressions in regard to the arts and ideas of the West, and in return acted as interpreter at Mr. Fenollosa's lectures, accompanied him on tours of research among the temples, and read widely on matters pertaining to art in the literatures of China and Japan.

In 1886 he became Secretary to the Minister of Education, and was put in charge of musical affairs. But later in the same year he accepted an appointment to membership in the Imperial Art Commission which the Japanese government organized and sent abroad to study the fine arts of the Western world. The results of these investigations in Europe and the United States met with just recognition, and on Mr. Okakura's return to Japan, the Government showed its appreci-

ation of his services and attainments by making him Director of the new Imperial Art School at Ueno, Tokyo. This institution represented the first serious reaction against the lifeless conservatism stills affected by adherents of the Bijitsu Kyokai Art Association and the equally uninspired imitation of Western Art fostered heretofore in the old Government Art School. While recognizing the ideals and realizing the possibilities of ancient Japanese Art, and at the same time aiming at a love and knowledge of the more sympathetic aspects of art in the West, the new school sought to rehabilitate the native arts on a new basis whose corner-stone should be "Life True to Self." For the carrying out of such a project Mr. Okakura possessed unusual qualifications, equipped as he was with a profound and reverent understanding of Asiatic art, and a considerable familiarity with the best that Europe had produced. But rapid political changes in Japan brought in their train renewed insistence on the adoption of Western ideas in every branch of activity, and when, in 1897, it became clear that European methods were to be given an ever-increasing prominence in the curriculum of the new Art School, Mr. Okakura felt obliged to resign his Directorship. Six months later he had gathered about him thirty-nine of the leading artists of the time,—including such painters as Hashimoto, Gaho, Kanzan, and Taikan,—with whose collaboration he organized and opened the Nippon Bijitsu-in, or Hall of Fine Arts, at Yanaka, in the suburbs of Tokyo. Here a fresh effort was made to assimilate all that is best in Western Art with the loftiest native traditions, so as to extend, without impairing, the vigor of national inspiration. The major and minor arts in all their forms were practiced and exhibited, and the success which attended this undertaking was soon felt in the strong influence which it exerted.

Prior to and during these activities, however, Mr. Okakura was profoundly interested in the researches which the Government had been led to make with a view to seeking out and registering the art treasures which then, much more than now, were scattered among the temples and monasteries of Japan. The first tentative steps in this direction were those taken by Professor Fenollosa during the early eighties. But the work was soon more thoroughly organized, accurate registration was begun, and to the prosecution of this important task Mr. Okakura devoted much of his energy. As time went on, stress

was laid upon the increasing rapidity with which the great paintings and sculptures, accumulated through the centuries by the religious sects, were passing into the possession of collectors all over the world, and public opinion finally became sufficiently aroused to enable Mr. Okakura to secure the enactment of legislation which declared all such works of art to be National Treasures, prohibited their sale or removal, and established as their custodians a body of artists and scholars known as the Imperial Archaeological Commission. With the work of this Commission Mr. Okakura was associated in an active or, later, advisory capacity until his death; and it is to him more than to any other man that Japan owes the preservation within her own borders of the painted and sculptured masterpieces of art which will always rank among the greatest achievements of the human race.

The results of Mr. Okakura's visits to China and India, where he made exhaustive studies, are brilliantly set forth in his book, "The Ideals of the East" (1903), explaining his important and now generally accepted analysis of the movements of thought and art throughout Asia. Other books by him, dealing with similar subjects, are "The Awakening of Japan" (1904) and "The Book of Tea" (1906). But apart from these volumes his literary activity was considerable. Some of his writings appeared in periodicals, notably in the earlier numbers of *Kokkwa*, and others are more permanently preserved in the art section of Brinckley's *Japan* and in *Japanese Temples and Their Treasures*, a government publication, of which Mr. Okakura was the editor and, to a great extent, the author. He also contributed to the publication of the "Histoire de l'Art du Japon," a monumental work compiled for the Japanese Commissioners to the Paris Exposition in 1910, and, in addition, he delivered many lectures—some of which have been published—before various learned societies and at the Imperial University of Tokyo, where in 1909, he was appointed Lecturer on Æsthetics.

His connection with The Boston Museum of Fine Arts first as Advisor and later as Curator of the Department of Chinese and Japanese Art, began in 1906. His first care was to begin the arrangement and classification of the vast collections of the Department with a view to cataloguing them. The mere mechanical labor was far greater than any one man could attend to, and he secured the assistance of compe-

tent experts from Japan to classify the lacquers and metal work, while he himself undertook the examination and cataloguing of paintings and sculptures. It was a matter of great interest to see how rapidly the systematic study of art in Japan along the lines of Western research had altered the standards of judgment in twenty years, especially in the matter of the conventional attributions, many of which were completely reversed. Pictures supposed to be originals were in some cases discarded, while their places were taken by others to which, twenty years before, relatively little importance had been assigned. This catalogue, which was finished comparatively lately, was made out in such a form that, after the usual details about the size, character, and attribution of each picture, a blank space is left for comment by any qualified expert who may be visiting the Museum. It remains a model for all time of what a catalogue should be.

Mr. Okakura's work was untiring, incessant and extended in many directions. He lectured much at the Museum and on many subjects.

He had the simplicity of genius. He was, perhaps, the greatest scholar and most original writer of modern times on Oriental Art. But this was far from being his only interest. His mind was encyclopedic. It seemed impossible to ask him a question, not only in regard to art and poetry, but in regard to history, or philosophy, or religion, in Japan, China, or India, which he could not answer from first knowledge, not only as a student, but as a traveler. He had been around the world repeatedly. He had been to China many times and visited pretty much every place noted in its religious, artistic, or political history. He spent nearly two years in India, with which he was equally familiar, notably in respect to religion, art, and philosophy. His grasp of our Western literature and fine arts was extraordinary. His appreciation was keen and his judgment sound and extremely discriminating. He liked Raphael and disliked Rubens. Of the Cubist pictures he said, "I stretch out my mind toward them; I touch nothing." He was past master in those refinements of Japanese civilization which are part of the education of a gentleman, such as writing poetry and arranging flowers, in music, in the formal tea ceremony, fencing, and jujitsu. He was an "Admirable Crichton" in his way, with a grasp of the best intellectual products of the highest civilizations on

both sides of the world, which completely invalidated Kipling's famous line:

"Oh, East is East, and West is West, and never the twain shall meet."

They met in Okakura-Kakuzo.

WILLIAM STURGIS BIGELOW.  
JOHN E. LODGE.

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#### THEODORE WILLIAM RICHARDS (1868-1928).

Fellow in Class I, Section 3, 1891.

Theodore William Richards was born in Germantown, Pennsylvania, on January 31, 1868. Of his father William Troost Richards (1833-1905) he has written: "A rare enthusiasm for the beauty of nature; remarkable technical facility with pencil and brush as an artist; strong visual memory and pictorial imagination. A very steady, straightforward, honorable, wise, generous man." Of his mother, Anna Matlack Richards (1835-1900), "Devoted to literature; unusual wit and originality; deep interest in religious and moral problems; an author of several books. A brilliantly intelligent, highly conscientious, high minded woman, who thought too deeply concerning the injustices and inequalities of human fate to be very happy."

The doubtful success of the local schools with the older children led his mother to undertake his entire primary and secondary education. When thirteen he was given a small box of chemicals and apparatus, in which he became deeply absorbed, and soon after he was invited to attend some of Wormley's lectures at the University of Pennsylvania. In 1882, when less than fifteen years of age, he became a sophomore at Haverford College—without having previously attended school—and began the formal study of chemistry under Lyman B. Hall. After graduation in 1885 he entered the senior class in Harvard College—its youngest member—and was awarded the bachelor's degree *summa cum laude* at the Commencement following. At Harvard he studied chemistry intensively under J. P. Cooke, H. B. Hill and C. L. Jackson, beginning while a senior his first research "On the constancy in the heat produced by the reaction of argentic nitrate on

solutions of metallic chlorides" which appeared in the Proceedings of this Academy in 1886. After graduation he investigated, in Cooke's laboratory, the relative atomic weights of oxygen and hydrogen and in addition those of copper and silver. The degrees of A.M and Ph.D. followed in 1888 after which he studied with Jannasch and with Victor Meyer at Göttingen, with Krüss at Munich, and with Hempel at Dresden. Before returning to Harvard in 1889 he visited many European laboratories, and became acquainted with most of the eminent chemists of that time.

In 1891 he was made Fellow of this Academy, which was thus the first of many learned societies to recognize his talents. He was its President 1919-1921, and published a large number of papers in its Proceedings.

In 1895 occurred the death of Cooke, whose "Chemical Physics" had done so much to stimulate in America the study of the new physical chemistry. The Corporation of the University at once voted Richards leave of absence for the second semester to study with Ostwald in Leipzig and with Nernst in Göttingen. Upon his return he succeeded Cooke in the exposition of this subject, and consistently applied its principles to the solution of his own experimental problems.

In 1896 he was married to Miss Miriam Stuart Thayer, daughter of the distinguished Biblical scholar Dr. Joseph Henry Thayer. Three children were born to them:—Grace Thayer Richards (Mrs. James B. Conant), William Theodore Richards (now assistant professor of chemistry at Princeton) and Greenough Thayer Richards, an architect. The delightful hospitality of their home at 15 Follen Street, Cambridge will not be forgotten by any who were privileged to share it.

In 1901 Richards was called to a full professorship of research at the University of Göttingen, for an American chemist an honor unprecedented. He accepted instead a similar promotion at Harvard, and at the same time the heavy burden of teaching which he had carried was materially lightened. But he never would surrender "Chemistry 8," in which modern chemical theory was approached in elementary fashion through a study of its history, or "Chemistry 6," which developed physical chemistry from a most clear and penetrating analysis of its fundamental concepts and relations.

In the spring of 1907 he was visiting (or exchange) professor at the

University of Berlin, where he lectured on exact quantitative procedure, and initiated a number of advanced workers into his laboratory methods.

On June 14, 1911, he delivered in London the Faraday Lecture of the Chemical Society on "The Fundamental Properties of the Elements" and received the Faraday Medal. He had always been deeply impressed by the personality and the achievements of the great Englishman, a large picture of whom was for many years displayed in his office. This occasion therefore brought him unique satisfaction.

Over half of Richards' scientific life had been spent in Boylston Hall, a building originally constructed for miscellaneous purposes and peculiarly unsuitable for exact chemical work. Crowds of students, dust, fumes, cramped quarters, and vibration had caused him incalculable worry and loss of time. But in 1912, graduates and friends of the University provided and endowed a modern research laboratory for the exclusive use of Richards and his collaborators. Bearing the name of Wolcott Gibbs, pioneer in American chemistry, this building embodies in every detail the experience and the foresight of its first Director. Fifteen years later he co-operated in designing the new Mallinckrodt and Converse laboratories at Harvard, and lived to see them far advanced toward completion.

The year 1913 was marked by his election to the presidency of the American Chemical Society. A year later he received notification of award of the Nobel Prize in Chemistry for 1915, the first American chemist to be so honored. His Nobel Lecture on Atomic Weights, delayed by the Great War, was published in 1921. Of the many other honors conferred upon him should be mentioned honorary degrees from Berlin, Christiania, Clark, Harvard, Haverford, Manchester, Oslo, Oxford, Pennsylvania, Pittsburgh, Prague, and Princeton; the Davy, Franklin, Willard Gibbs, LeBlanc, Lavoisier, and Rumford medals; membership in twelve of the most important learned societies of the world; decorations with the Cross of an Officer of the Legion of Honor. In 1925, Thomas W. Lamont established at Harvard the Theodore William Richards Professorship in memory of his brother Hammond, Richards' classmate and friend.

Over three hundred papers were published by Richards individually or in collaboration with students or assistants. These papers were

indeed extraordinary in originality, scope, thoroughness and skill in execution. Not second in importance to their outcome were the ingenious devices and the refinements in method incident to them.

His early fame rested mainly upon his revisions of the atomic weights, the possible implications of which always fascinated his imagination. His apparatus and technique set the standards for subsequent work, and his values have been universally adopted.

The research with J. P. Cooke on oxygen and hydrogen, mentioned above, offered the first proof that the ratio of their atomic weights is distinctly less than 16:1, and gave a result for hydrogen differing by only four parts in ten thousand from the present accepted value. Observations made in the course of the above work led to an investigation of the atomic weight of copper, which continued until 1891, and which showed that oxides prepared by ignition of nitrates always retained gases. The elimination of this error led to a better atomic weight for copper, and pointed the way to a revision of other atomic weights as well.

Barium chloride and barium bromide were next analyzed. Complete expulsion of water without decomposing the salts, and careful corrections for the solubility of silver chloride were the chief improvements which resulted in a greatly improved atomic weight for barium. Strontium, magnesium, zinc, nickel, cobalt, iron, uranium, calcium and cesium were then studied in succession, by following methods similar to those previously followed.

Richards' analyses of strontium chloride and bromide respectively led to divergent results for the atomic weight of strontium. Could the atomic weights of chlorine and of bromine as determined by the great Belgian chemist Stas have been in error? The investigation of sodium chloride and bromide, in 1904, showed that Stas' value for bromine was correct, but that his figure for sodium was distinctly too high and that for chlorine considerably too low. In the course of this work the errors into which Stas had fallen were revealed and eliminated. Inevitably these researches raised questions regarding the accuracy of other atomic weights in use at that time. Potassium, sulfur and nitrogen were attacked, the latter in part at Berlin during Richards' exchange professorship there. In the synthesis of silver nitrate new evidence was added to the usual criteria of the purity of the final pro-

duct of the experiments by completely decomposing it and demonstrating its freedom from water. The extreme variation between the results of six successive experiments was less than one thousandth of a percent,—an unexampled degree of concordance. Lithium also received attention, and Stas' result was shown to be a whole percent too high, "because all the defects in his process accumulated on the head of this the lightest of all the metals."

Richards has emphasized that the chemical difficulties in atomic weight work greatly exceed the physical ones,—weighing for instance. Therefore a relatively small quantity of material of undoubted purity properly handled will give a better result than the huge quantities of less pure material taken for analysis by Stas. The control of the solubility of precipitates (and of the walls of containing vessels), elimination of the occlusion of foreign substances by solids, and the complete expulsion of water without hydrolysis from all substances that must be weighed, are the chief requisites for success. These objects were attained with the help of the nephelometer, a device for estimating the quantity of suspended precipitate by means of the light reflected from it, by consistent use of the centrifuge after crystallizations, and by a bottling device which made it possible to enclose and weigh a pure anhydrous compound without an instant's exposure to the outside air.

In 1914, Fajans sent his pupil Max Lembert to Richards with a sample of "lead" of radioactive origin to find whether the end product of disintegration of the uranium-radium series did indeed have an atomic weight of 206, i. e. a unit less than that of ordinary lead. This sample also others from uranium and thorium minerals were investigated, and atomic weights ranging from 206.40 to 206.82 resulted. The deficiency thus attained 0.75 unit. This rough experimental verification of the theory of isotopes attracted wide attention and greatly stimulated activity in this type of research. Further work in Richards' laboratory lowered the "record" on uranium lead to 206.07, which would be lowered to 206.02 if a correction were made for the thorium lead doubtless present. Of equal interest was the proof that the physical properties agreed within a small limit of error with those of common lead in all respects except those fixed by mass. Thus *molal* solubility was identical, as well as refractivity, melting point and

thermoelectric height. Attempts to effect partial separation of isotopes of lead by fractional crystallization or by fractional distillation of lead tetraphenyl yielded negative results.

The atomic weight of carbon was attacked by converting sodium carbonate into sodium bromide and this into silver bromide, thus obtaining the molecular weight of sodium carbonate in terms of silver. Also sodium carbonate was converted into sodium sulfate and the molecular weight of the latter referred to silver through the molecular weight of sodium carbonate. Richards spoke of these researches as confirming, by cross-reference, many varied methods and results. Revision of aluminum was of interest as quite definitely placing aluminum slightly below 27. Gallium determined with elaborate care (first revision since discovery, 1878) yielded 69.716, widely departing from an integral value.

The accurate determination of atomic weight now enjoys added importance by indicating (1) whether given elements are probably simple or complex (2) the packing effect in simple elements (3) whether the relative proportions of isotopes determined by Aston's mass spectrograph predict a reasonable average atomic weight (4) whether a given atomic disintegration scheme is plausible.

Richards' second major interest was centered in the volume occupied by matter. His early suspicion that the quantity "b" in the equation of van der Waals was variable led to his hypothesis of the compressible atom, slow of general acceptation, but today an integral part of physical and chemical theory. The striking contractions which elements suffer upon union to form compounds he properly attributed to the compression and deformation of atoms by gigantic cohesive and chemical affinities. In developing his theory he measured with precision the compressibilities of about forty elements, and showed the former to be a function of atomic volume. As he expected, those elements which were already most compressed under increased external pressures. He not only demonstrated, as Davy had indeed foreshadowed, that the contractions incident to compound formation were nearly proportional to the energy changes of the corresponding reactions, but also proved that the proportionality is much more exact if due allowance is made for the individual compressibilities. In another series of papers he furnished new and exact data on densities,

surface tension and heats of combustion, and correlated these properties as well as melting points, boiling points and latent heats with compressibilities, interpreting the regularities in terms of cohesive and chemical affinities and emphasizing in the case of the elements, the periodic relationships. These undertakings were in part responsible for his brilliant investigations in the field of thermochemistry, which we must now consider.

Richards' very first paper as previously stated, dealt with thermochemistry. He resumed publication in this field in 1905, describing a novel and precise method of determining specific heats and reaction heats of liquids. The same year saw the beginnings of adiabatic calorimetry, which was later developed in elaborate detail, including an automatic method (synthermal regulator) for keeping the temperature of outside bath exactly equal to that of calorimeter over long periods, thus making possible exact determinations of energy changes in slow reactions. The specific heats of elements at low temperature, the adiabatic determination of heats of solution of metals in acids, of heats of combustion of organic compounds, heats of vaporization, specific heats and heats of neutralization as well as heats of dilution of solutions of acids, bases and salts, provided thermochemistry with a wealth of accurate data previously lacking and furnished the basis for new thermodynamic generalizations. Just as important as these data were the improved apparatus, the tricks of manipulation, and the demonstration of sources of error hitherto unrecognized or hopefully neglected. Noteworthy was the elaborate calculation involving carefully determined heats of dilution by which Julius Thomsen's errors were demonstrated, and the proper values of the heats of solution of metals in acids as dilute as  $HCl \cdot 200 H_2O$  were figured from data obtained in stronger acids.

Seldom has such mastery of the use of the mercury thermometer been attained as in Richards' laboratory. In 1898, recognizing the difficulties which chemists must encounter in this difficult art, he began a series of determinations of transition temperatures of hydrated salts, first sodium sulfate, later sodium bromide, manganous chloride, sodium chromate, and strontium chloride, to serve as reference points. From 1902 on, these were referred to the international standard. For calibrations below zero he determined the equilibrium tempera-

tures between pure ice and hydrochloric acid solutions of various concentrations. The method of floating equilibrium consisted in determining the temperatures at which different analyzed solutions of a given salt would attain exactly the same density as a given float, and the graph depicting such data serves for later calibration of thermometers,—if the float retains its average density unaltered or if a minimal change in density can be evaluated by extrapolation. Reversing the method, densities can be determined in terms of temperatures. The solubility curve of sodium sulfate also was applied to calibration of thermometers as well as a calorimetric method using electrical energy for dividing up temperature intervals. Of all these methods, the transition temperature of sodium sulfate, whose unusual crystal form is conducive to easy and certain purification, will perhaps remain the most valuable.

In Richards' later calorimetric work, thermoelements played a prominent part, and their manipulation and vagaries were studied with the same thoroughness that marked his use of mercurial thermometers.

Richards' electrochemical work had far-reaching consequences. In 1902, after a study of a series of galvanic cells of the Daniell type, he pointed out and correctly explained the relation between the sign (and magnitude) of the difference between free and total energy change in a given chemical reaction and the sign (and magnitude) of the heat capacity changes involved in the same reaction. He showed that free and total energy should be identical when no heat capacity changes occur, and that in other cases the two should approach each other with falling temperatures, and become equal at the absolute zero. Upon these relations clearly outlined by Richards, Nernst later based his "third law of thermodynamics." Experiments about the same time on Faraday's Law showed it to be extremely exact and generally applicable. Richards studied at length cells having as electrodes amalgams of a given metal in different concentrations. As these became exceedingly dilute, the electromotive force approached as a limit that predicted by the gas law, while the deviations measured at higher concentrations were shown to illustrate other thermodynamic relations. Among single potentials revised should be mentioned that of iron, and the influence upon it of occluded hydrogen, including also the effect of a magnetic field.

Other important studies all worthy of extended discussion, treated cuprammonium salts, reaction mechanism, complex ion formation, a kinetoscope for the study of crystal growth by successive instantaneous photographs; the relation between the taste of acids and their degree of dissociation, improved methods for vapor-density determination and metallography.

Richards' almost life-long interest in cohesion and its effect upon volume culminated in efforts to evaluate the internal pressures of solids. An analysis of his reasoning from his data, though of great interest, would be too lengthy, so that it must suffice to give his final expression:

$$p + \pi_0 \left( \frac{V_0}{V} \right)_T^m = (\pi_\varphi)_0 \left( \frac{V_0}{V} \right)_T^n + P$$

Here  $p$  represents external pressure, and  $V$  the volume,  $\pi$  is the internal or intrinsic cohesive pressure (i. e. inherent in the material)  $\pi_\varphi$  the internal or intrinsic distending pressure and  $P$  the internal thermal pressure. Of the exponents  $m$  must be smaller than  $n$ . The subscript zero refers to the condition when  $p = 0$ , and  $T$ , of course, indicates the temperature of the system in equilibrium. Thus the sum of external and cohesive pressures balances the sum of distending and thermal pressures. Richards calculated the intrinsic cohesive pressures at 200°C of nineteen isotropic elements, and obtained values ranging from 8000 megabars in the case of cesium to 1,020,000 in the case of tungsten.

The desire to impart to others his skill, his ideals and his love for research stood on a par with his enthusiasm for his own projects. Not less than eighty-eight names of his research students or more advanced collaborators appear on his published papers, and few indeed worked under his direction without turning out publishable results. An unusually large proportion of his students have reached positions of importance in research, teaching and industry. They, and their pupils in turn, have greatly extended the range of Richards' influence upon the development of chemistry in America and even in other countries.

Richards always distrusted hypothesis to the extent that clean-cut experimental verification, in the given case, appeared to him remote,

so that his published papers give little idea of the constant activity of his vivid scientific imagination. He maintained, besides, that extended mathematical treatment of the complexities of chemical systems and chemical changes is much more likely to lead the experimenter astray than if applied to the more simple phenomena of physics; so he usually contented himself with the mere statement of data, and inferences obviously valid. His experimental work was never subjected to correction except in the matter of a small over-estimation of the occlusions in the silver coulometer. He was conservative in his own claims regarding priority, and generous in the acknowledgment of the deserts of others. In the light of these facts, we can readily explain the freedom of his record from the polemics which have embittered and hampered so many eminent scientists. His energies were thus conserved for his ever-broadening program of activity in research. Not everybody realized that it was only his devotion to this which often prompted his courteous declination of requests to participate in conventions, meetings, committee work, consultation work, editorial work, and compilations, which choke the careers of so many promising scientific men. His oft-repeated words "Every hour is precious" voiced a deep conviction which consistently guided his decisions in such matters.

Any attempt to characterize briefly so many sided a man must fall short of adequacy, but, at the least, tribute must be paid to his amazing experimental skill and critical judgment of experimental data; his unsurpassed standards of scientific integrity, no matter what the price in time, energy, outlay, expectation; his deep insight into the underlying significance of physical and chemical phenomena and the clarity with which he explained them; his enthusiasm, patience, and good humor, which never failed in trying circumstances; his keen enjoyment of the finest in art, music, and literature; his solid administrative ability and sound business sense; his genuine interest in the scientific and personal problems of those who sought his help, even to the humblest freshman; and the unsparing expenditure of self in every duty up to the very end of his life. He has won an enduring place in science and the undying esteem and affection of those who labored with him.

GEORGE SHANNON FORBES.

## ADDISON EMERY VERRILL (1839-1926).

Fellow in Class II, Section 3, 1887.

In 1864, when Yale decided to introduce the science of zoology into her curriculum, she naturally looked to Louis Agassiz to supply a man with the training needed to establish such a department, and it was her good fortune that his choice fell upon a promising young assistant of his, Addison Emery Verrill.

A native of Maine, Verrill had been enthusiastic in his pursuit of natural history since early boyhood, and by systematic collecting and study of both plants and animals had already laid the foundation for his life work in taxonomy. He arrived at Harvard in the spring of 1859, the year following was made assistant to Agassiz in the Museum of Comparative Zoology, and received his B.S. degree in 1862.

His first work at Yale was the development of a zoological museum out of the old "Natural History Cabinet," a task he continued with such diligence that when he relinquished it in 1910 the Yale series of marine invertebrates was one of the best in American museums. The great bulk of these accessions came as the result of his connection with the United States Fish Commission, which entrusted to him the supervision of the material assembled during a comprehensive survey of the coastal waters of New England made between the years 1871 and 1887.

This constant stream of material passing through Verrill's hands brought to light many forms new to science, and these he described from time to time, thus becoming the author of a large number of new species. In fact, the new forms that he described in the course of his life are said to total over a thousand. When the dredging was completed, it was his plan to monograph the various groups, but he was able to carry this out for only the nemerteans and planarians.

In addition to this work on the New England waters, Verrill became interested in various other faunal regions, and visited them personally for the purpose of studying their life. In 1861 he made a famous trip to Anticosti Island and Labrador with Shaler, Hyatt, and Upham Treat, the four dividing amongst them the duties of navigation as well as those of scientific investigation, and the material thus gathered was later described in part by Verrill. Almost forty years later he

turned his attention southward to the Bermudas, which he described not only faunally, but physiographically, geologically, and historically, in a monograph of 548 pages (1902). At the age of eighty-five, says Professor W. R. Coe, his successor and biographer, "he entered upon the exploration of the marine fauna of the island of Kauai, in the Hawaiian Island group, with all the enthusiasm he had felt in his college days at Anticosti."

Due to unusual physical strength and endurance, permitting him to work far longer hours than is possible for most men, Verrill's record of accomplishment was prodigious, his published papers numbering more than 350. Of the various marine invertebrates, he paid particular attention to the coelenterates and echinoderms, producing upward of fifty papers or monographs on each of these groups, among which might be mentioned especially his monograph on the Alcyonaria of the Blake Expedition (now in press) and his two-volume work on the shallow-water starfishes of the North Pacific. Deserving mention also as perhaps his most widely known work is his "Report on the Invertebrate Animals of Vineyard Sound and Adjacent Waters" (1872), which was for more than thirty years the classic reference book for studies of that region. In these works, as in others, he had the valuable assistance of his brother-in-law, Professor Sidney I. Smith, professor of comparative anatomy at Yale from 1875 to 1906. Of great reference value also are the zoological definitions and their illustrations in Webster's International Dictionary, which came from Verrill's pen.

In brief, again to quote Professor Coe: "With the exception of the protozoa, the taxonomy of every one of the invertebrate phyla shows the effect of Verrill's labors. In some, the general scheme of classification was modified, in others new genera and species were added. In all, he exhibited what seems to have been a natural intuition as to the significance of morphological characters which amounted almost to genius. . . . There seems little doubt that future generations will accord him recognition as one of America's greatest systematic zoologists and one of the most productive of our zoological pioneers" (*Amer. Jour. Sci.* (5), vol. 13, 1927, p. 386).

CHARLES SCHUCHERT.

## ALLYN ABBOTT YOUNG (1876-1929).

Fellow in Class III, Section 3, 1921.

Allyn Abbott Young was born at Kenton, Ohio, September 19, 1876. He was of New England stock, his forbears English on both sides. The family was intellectual; the father, a brother, and a sister, were teachers of high quality. His undergraduate work was done at Hiram College, Ohio, where he graduated in 1894. After taking his Ph.D. degree at Wisconsin in 1902, he entered on a remarkably varied academic career, at Western Reserve University, Dartmouth College, the University of Wisconsin, Stanford University, Washington University (St. Louis), Cornell University, Harvard University, and the London School of Economics. At each institution he left an abiding mark, and from each he was drawn to the next not only by the prospect of higher position and more congenial work, but by a certain spirit of adventure. His was a wide-roving disposition; the trait showed itself not only in the many shifts of his career but in the range of his scholarly work. It was this trait which explains the very last move, which ended so tragically. He had cast his lot with Harvard University for good—of this he and his associates had no question—when he was asked in 1927 to accept the professorship of Political Economy at the University of London. Brought into close personal touch with European statesmen and economists in the course of his service on various committees and organizations dealing with the post-war problems in economics and politics, he had made on them the impression of signal competence which never failed. Hence the London invitation. It proved tempting, not only because of the attraction which a new sphere of work always had for him, but because of a natural pride in being the first American economist invited to a high academic post in European countries. After repeated solicitation, and much searching of heart, he finally accepted a three year appointment, the Harvard Corporation generously giving leave of absence for this unusually long period. His English friends made no secret of their wish to retain him permanently; and in the course of the academic year 1928-1929 he was also tendered a professorship at the University of Chicago on terms highly attractive both as to salary and duties. But he never had an expectation of remaining at London after the

three year period; his heart was at Harvard, and he had made up his mind to return there.

All these expectations were confounded by his sudden death. He had been in the United States shortly before, in December-January, apparently in full vigor; and a few days before the end had taken the lead in a discussion of the reparations question at a dinner-meeting of the historic Political Economy Club of London. An attack of influenza developed into virulent pneumonia and he died after a few days of illness on March 6th, 1929.

Young's attainments were extraordinarily wide. Within the range of economics there was hardly a field in which he was not eminently competent. From the most refined theoretical niceties to the most complicated realistic situations, his grasp was secure and his judgment keen. He was a mathematician of the first order; a statistician attentive to the concrete phenomena underlying the bare figures as well as to the most exacting requirements of refined technique; conversant with economic history; alive to the remarkable and often unique phenomena which have unrolled themselves before our eyes during these first three decades of the twentieth century; above all, a master of the principles of economics, steeped in the great literature of the subject, its method, its relation to other disciplines. With this complete grasp of his chosen subject, he combined an interest and comprehension in a wide range of others,—not only history and politics, but natural science, philosophy, and literature. He had picked up for himself an abundant linguistic equipment. Not least, he had a deep warm interest in music, was no mean performer on the organ, and at one stage in his career supplemented a slender income by playing that instrument. He knew all the great composers and their works, enjoyed and judged a great interpretation. Here, as in his intellectual outlook, he valued the old without belittling the new.

Young left behind him no large body of written work. A great number of reviews and brief notes, and some elaborate papers, on a surprising variety of subjects, appeared in periodicals and in the transactions of societies. Some of the more notable of these were gathered in a volume, "Economic Problems New and Old," published in 1927. He had in preparation a book on money and credit—one of

the many fields in which he had worked intensively—and it is hoped that enough of this is in definitive form to justify publication. He had planned also to write a book on the fundamentals of economic theory. No one was better qualified for this ambitious task. Everything that he wrote bore the marks of independent thought, keen discrimination, ripe judgment, a background of much more than could be set forth at the moment. And everything bore the marks of the literary craftsman. He had the gift of rounded and dignified utterance; not so pellucid as to save the need of attention and reflection, always allusive, but always urbane, and of unmistakable intellectual distinction. Perhaps he was at his best in papers and addresses surveying some broad subject; such as the presidential address before the American Economic Association on "Economics and War," a paper at the University of Virginia on "The Trend of Economics," the inaugural lecture at the University of London on "English Political Economy," and the presidential address before Section F of the British Association on "Increasing Returns and Economic Progress."

Tall and alert, handsome in feature, impressive in bearing, mature and poised, he made his mark whatever the company. And with distinction he combined unfailing sympathy and responsiveness. No one ever went to him, whether a troubled colleague or a timid novice, without helpful response. He was perhaps at his best with advanced students who were probing their way into the core of some intricate problem.

To all, young and old, he gave of his time and strength without stint. Probably he gave too much; more could have been achieved for the world and for himself if he had been firmer in saying no. One of the things that tempted him to the London adventure was the prospect (which he thought he saw) of less distraction and greater leisure. But he remained the same, attractive and outpouring, and in London as elsewhere men of all degrees and kinds, students, colleagues, notables in every field, turned to him. Invitations to lectures and meetings multiplied, posts of honor and duty were offered, and the expected freedom for his plans of independent work did not come. The besetting difficulty was his own charm, his own wide competence, his unfailing readiness. He died at the full height

of his powers, lamented by a host of friends and admirers, and by none more than by those to whom he had endeared himself at Harvard University.

FRANK W. TAUSSIG,  
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Alfred Church Lane . . . . .	Cambridge
Esper Signius Larsen, Jr. . . . .	Cambridge
Andrew Cowper Lawson . . . . .	Berkeley, Cal.
Charles Kenneth Leith . . . . .	Madison, Wis.
Waldemar Lindgren . . . . .	Brookline
Frederic Brewster Loomis . . . . .	Amherst
Alexander George McAdie . . . . .	Readville
Donald Hamilton McLaughlin . . . . .	Cambridge
Kirtley Fletcher Mather . . . . .	Cambridge
John Campbell Merriam . . . . .	Washington, D. C.

William John Miller . . . . .	Los Angeles, Cal.
Charles Palache . . . . .	Cambridge
Percy Edward Raymond . . . . .	Lexington
Austin Flint Rogers . . . . .	Palo Alto, Cal.
Robert Wilcox Sayles . . . . .	Chestnut Hill
Waldemar Theodore Schaller . . . . .	Washington, D. C.
Charles Schuchert . . . . .	New Haven, Conn.
William Berryman Scott . . . . .	Princeton, N. J.
Hervey Woodburn Shimer . . . . .	Hingham
Frank Bursley Taylor . . . . .	Fort Wayne, Ind.
Thomas Wayland Vaughan . . . . .	La Jolla, Cal.
Robert DeCourcy Ward . . . . .	Cambridge
Charles Hyde Warren . . . . .	New Haven, Conn.
David White . . . . .	Washington, D. C.
Herbert Percy Whitlock . . . . .	New York, N. Y.
Bailey Willis . . . . .	Palo Alto, Cal.
Arthur Winslow . . . . .	Boston
John Eliot Wolff . . . . .	Pasadena, Cal.
Frederick Eugene Wright . . . . .	Washington, D. C.

CLASS II, SECTION II.—*Botany*.—40.

Le Roy Abrams . . . . .	Stanford University, Cal.
Oakes Ames . . . . .	North Easton
Joseph Charles Arthur . . . . .	Lafayette, Ind.
Irving Widmer Bailey . . . . .	Cambridge
Liberty Hyde Bailey . . . . .	Ithaca, N. Y.
Edward Wilber Berry . . . . .	Baltimore, Md.
Nathaniel Lord Britton . . . . .	New York, N. Y.
Douglas Houghton Campbell . . . . .	Palo Alto, Cal.
George Perkins Clinton . . . . .	New Haven, Conn.
Bradley Moore Davis . . . . .	Ann Arbor, Mich.
Edward Murray East . . . . .	Jamaica Plain
Rollins Adams Emerson . . . . .	Ithaca, N. Y.
Alexander William Evans . . . . .	New Haven, Conn.
Joseph Horace Faull . . . . .	Cambridge
Merritt Lyndon Fernald . . . . .	Cambridge
Richard Thornton Fisher . . . . .	Petersham

Harvey Monroe Hall . . . . .	Stanford University, Cal.
Robert Almer Harper . . . . .	New York, N. Y.
Albert Spear Hitchcock . . . . .	Washington, D. C.
John George Jack . . . . .	East Walpole
Edward Charles Jeffrey . . . . .	Cambridge
Willis Linn Jepson . . . . .	Berkeley, Cal.
Ivan Murray Johnston . . . . .	Cambridge
Fred Dayton Lambert . . . . .	Tufts College
Jacob Goodale Lipman . . . . .	New Brunswick, N. J.
Burton Edward Livingston . . . . .	Baltimore, Md.
Elmer Drew Merrill . . . . .	Berkeley, Cal.
Winthrop John Vanleuven Osterhout . . . . .	New York, N. Y.
George James Peirce . . . . .	Palo Alto, Cal.
Alfred Rehder . . . . .	Jamaica Plain
Benjamin Lincoln Robinson . . . . .	Cambridge
Karl Sax . . . . .	Jamaica Plain
William Albert Setchell . . . . .	Berkeley, Cal.
Arthur Bliss Seymour . . . . .	Cambridge
Elvin Charles Stakman . . . . .	St. Paul, Minn.
William Codman Sturgis . . . . .	New York, N. Y.
Roland Thaxter . . . . .	Cambridge
William Trelease . . . . .	Urbana, Ill.
William Henry Weston, Jr. . . . . .	Cambridge
Ernest Henry Wilson . . . . .	Jamaica Plain

CLASS II., SECTION III.—*Zoology and Physiology*.—69.

Nathan Banks . . . . .	Cambridge
Thomas Barbour . . . . .	Boston
Francis Gano Benedict . . . . .	Boston
Henry Bryant Bigelow . . . . .	Concord
Robert Payne Bigelow . . . . .	Brookline
Edwin Garrigues Boring . . . . .	Cambridge
William T. Bovie . . . . .	Chicago, Ill.
Edward Allen Boyden . . . . .	University, Ala.
John Louis Bremer . . . . .	Boston
Charles Thomas Brues . . . . .	Jamaica Plain
John Wymond Miller Bunker . . . . .	Belmont

Walter Bradford Cannon . . . . .	Cambridge
Thorne Martin Carpenter . . . . .	Boston
William Ernest Castle . . . . .	Belmont
Charles Value Chapin . . . . .	Providence, R. I.
Benjamin Preston Clark . . . . .	Boston
Lemuel Roscoe Cleveland . . . . .	Jamaica Plain
Edwin Joseph Cohn . . . . .	Cambridge
Edwin Grant Conklin . . . . .	Princeton, N. J.
Manton Copeland . . . . .	Brunswick, Me.
William John Crozier . . . . .	Cambridge
Joseph Augustine Cushman . . . . .	Sharon
Charles Benedict Davenport . . . . .	Cold Spring Harbor, N. Y.
Hallowell Davis . . . . .	Cambridge
Samuel Randall Detwiler . . . . .	New York, N. Y.
Raymond Dodge . . . . .	New Haven, Conn.
Gilman Arthur Drew . . . . .	Eagle Lake, Fla.
Cecil Kent Drinker . . . . .	Boston
Herbert McLean Evans . . . . .	Berkeley, Cal.
Henry Clinton Fall . . . . .	Tyngsboro
Alexander Forbes . . . . .	Milton
Joseph Grinnell . . . . .	Berkeley, Cal.
Samuel Henshaw . . . . .	Cambridge
Leigh Hoadley . . . . .	Cambridge
Samuel Jackson Holmes . . . . .	Berkeley, Cal.
Roy Graham Hoskins . . . . .	Brookline
Leland Ossian Howard . . . . .	Washington, D. C.
Herbert Spencer Jennings . . . . .	Baltimore, Md.
Charles Willison Johnson . . . . .	Brookline
Charles Atwood Kofoid . . . . .	Berkeley, Cal.
Frederic Thomas Lewis . . . . .	Waban
Ralph Stayner Lillie . . . . .	Chicago, Ill.
Richard Swann Lull . . . . .	New Haven, Conn.
Edward Laurens Mark . . . . .	Cambridge
Ernest Gale Martin . . . . .	Palo Alto, Cal.
Albert Davis Mead . . . . .	Providence, R. I.
Axel Leonard Melander . . . . .	New York, N. Y.
Gerrit Smith Miller . . . . .	Washington, D. C.

Thomas Hunt Morgan . . . . .	Pasadena, Cal.
Herbert Vincent Neal . . . . .	Tufts College
Henry Fairfield Osborn . . . . .	New York, N. Y.
George Howard Parker . . . . .	Cambridge
William Patten . . . . .	Hanover, N. H.
Raymond Pearl . . . . .	Baltimore, Md.
John Charles Phillips . . . . .	Wenham
Henry Augustus Pilsbry . . . . .	Philadelphia, Pa.
Frederick Haven Pratt . . . . .	Wellesley Hills
Herbert Wilbur Rand . . . . .	Cambridge
Arthur Clarence Redfield . . . . .	Boston
William Emerson Ritter . . . . .	Berkeley, Cal.
Alexander Grant Ruthven . . . . .	Ann Arbor, Mich.
Percy Goldthwait Stiles . . . . .	Newtonville
John Eliot Thayer . . . . .	Lancaster
John Broadus Watson . . . . .	New York, N. Y.
Arthur Wisswald Weysse . . . . .	Boston
William Morton Wheeler . . . . .	Jamaica Plain
Edmund Beecher Wilson . . . . .	New York, N. Y.
Frederick Adams Woods . . . . .	New York, N. Y.
Robert Mearns Yerkes . . . . .	Washington, D. C.

CLASS II., SECTION IV.—*Medicine and Surgery*.—52.

Nathaniel Allison . . . . .	Boston
James Bourne Ayer . . . . .	Milton
Kenneth Daniel Blackfan . . . . .	Brookline
Charles Macfie Campbell . . . . .	Cambridge
Alexis Carrel . . . . .	New York, N. Y.
David Cheever . . . . .	Boston
Henry Asbury Christian . . . . .	Boston
Stanley Cobb . . . . .	Ponkapoag
Rufus Cole . . . . .	New York, N. Y.
Harvey Cushing . . . . .	Brookline
Simon Flexner . . . . .	New York, N. Y.
James Lawder Gamble . . . . .	Brookline
Joseph Lincoln Goodale . . . . .	Boston
Robert Battey Greenough . . . . .	Boston

Ross Granville Harrison . . . . .	New Haven, Conn.
Percy Rogers Howe . . . . .	Boston
William Henry Howell . . . . .	Baltimore, Md.
Reid Hunt . . . . .	Boston
Henry Jackson . . . . .	Boston
Elliott Proctor Joslin . . . . .	Boston
William Williams Keen . . . . .	Philadelphia, Pa.
Roger Irving Lee . . . . .	Brookline
Edwin Allen Locke . . . . .	Boston
Warfield Theobald Longcope . . . . .	Baltimore, Md.
Frank Burr Mallory . . . . .	Brookline
William James Mayo . . . . .	Rochester, Minn.
James Howard Means . . . . .	Boston
George Richards Minot . . . . .	Boston
William Lorenzo Moss . . . . .	Jamaica Plain
John Howard Mueller . . . . .	Boston
Robert Bayley Osgood . . . . .	Boston
Joseph Hershey Pratt . . . . .	Boston
William Lambert Richardson . . . . .	Boston
Milton Joseph Rosenau . . . . .	Brookline
Andrew Watson Sellards . . . . .	Boston
Theobald Smith . . . . .	Princeton, N. J.
Torald Hermann Sollmann . . . . .	Cleveland, Ohio
Charles Wardell Stiles . . . . .	Washington, D. C.
Richard Pearson Strong . . . . .	Boston
Fritz Bradley Talbot . . . . .	Brookline
Edward Wyllis Taylor . . . . .	Boston
William Sydney Thayer . . . . .	Baltimore, Md.
Ernest Edward Tyzzer . . . . .	Wakefield
Frederick Herman Verhoeff . . . . .	Boston
Henry Pickering Walcott . . . . .	Cambridge
Joseph Treloar Wearn . . . . .	Cleveland, Ohio
William Henry Welch . . . . .	Baltimore, Md.
Benjamin White . . . . .	Boston
Francis Henry Williams . . . . .	Boston
Simeon Burt Wolbach . . . . .	Boston
Horatio Curtis Wood . . . . .	Philadelphia, Pa.
Hans Zinsser . . . . .	Boston

CLASS III.—*Moral and Political Sciences*.—181.

**SECTION I.—*Theology, Philosophy, and Jurisprudence.*—41.**

Joseph Henry Beale	.	.	.	.	.	Cambridge
Edgar Sheffield Brightman	.	.	.	.	.	Newton Centre
Walter Fenno Dearborn	.	.	.	.	.	Cambridge
Edmund Burke Delabarre	.	.	.	.	.	Providence, R. I.
Edward Staples Drown	.	.	.	.	.	Cambridge
William Harrison Dunbar	.	.	.	.	.	Cambridge
William Wallace Fenn	.	.	.	.	.	Cambridge
Frederick Perry Fish	.	.	.	.	.	Brookline
Thomas Hovey Gage	.	.	.	.	.	Worcester
William Henry Paine Hatch	.	.	.	.	.	Cambridge
William Ernest Hocking	.	.	.	.	.	Cambridge
Charles Evans Hughes	.	.	.	.	.	New York, N. Y.
Frederick John Foakes Jackson	.	.	.	.	.	New York, N. Y.
Albert Cornelius Knudson	.	.	.	.	.	Cambridge
William Lawrence	.	.	.	.	.	Boston
Frederick Lawton	.	.	.	.	.	Boston
Clarence Irving Lewis	.	.	.	.	.	Cambridge
William Caleb Loring	.	.	.	.	.	Boston
William McDougall	.	.	.	.	.	Durham, N. C.
Edward Caldwell Moore	.	.	.	.	.	Cambridge
John Bassett Moore	.	.	.	.	.	New York, N. Y.
George Herbert Palmer	.	.	.	.	.	Cambridge
Charles Edwards Park	.	.	.	.	.	Boston
Leighton Parks	.	.	.	.	.	New York, N. Y.
Francis Greenwood Peabody	.	.	.	.	.	Cambridge
George Wharton Pepper	.	.	.	.	.	Philadelphia, Pa.
Ralph Barton Perry	.	.	.	.	.	Cambridge
Rosecoe Pound	.	.	.	.	.	Watertown
Elihu Root	.	.	.	.	.	New York, N. Y.
James Hardy Ropes	.	.	.	.	.	Cambridge
Arthur Prentice Rugg	.	.	.	.	.	Worcester
James Hugh Ryan	.	.	.	.	.	Washington, D. C.
George Augustus Sanderson	.	.	.	.	.	Littleton
George Sarton	.	.	.	.	.	Cambridge
Austin Wakeman Scott	.	.	.	.	.	Cambridge

Willard Learoyd Sperry . . . . .	Cambridge
Russell Henry Stafford . . . . .	Brookline
William Cushing Wait . . . . .	Medford
Eugene Wambaugh . . . . .	Cambridge
Henry Bradford Washburn . . . . .	Cambridge
Quincy Wright . . . . .	Chicago, Ill.

CLASS III., SECTION II.—*Philology and Archaeology*.—53.

Francis Greenleaf Allinson . . . . .	Providence, R. I.
Franz Boas . . . . .	New York, N. Y.
Ingersoll Bowditch . . . . .	Jamaica Plain
Carl Darling Buck . . . . .	Chicago, Ill.
Eugene Watson Burlingame . . . . .	Albany, N. Y.
Edward Capps . . . . .	Princeton, N. J.
George Henry Chase . . . . .	Cambridge
Walter Eugene Clark . . . . .	Cambridge
Roland Burrage Dixon . . . . .	Cambridge
Franklin Edgerton . . . . .	New Haven, Conn.
Jeremiah Denis Mathias Ford . . . . .	Cambridge
James Geddes, Jr. . . . .	Brookline
Charles Hall Grandgent . . . . .	Cambridge
Louis Herbert Gray . . . . .	New York, N. Y.
William Chase Greene . . . . .	Cambridge
Charles Burton Gulick . . . . .	Cambridge
Roy Kenneth Hack . . . . .	Cincinnati, O.
William Arthur Heidel . . . . .	Middletown, Conn.
George Lincoln Hendrickson . . . . .	New Haven, Conn.
Bert Hodge Hill . . . . .	Athens, Greece
Elijah Clarence Hills . . . . .	Berkeley, Cal.
William Henry Holmes . . . . .	Washington, D. C.
Earnest Albert Hooton . . . . .	Cambridge
Edward Washburn Hopkins . . . . .	New Haven, Conn.
William Guild Howard . . . . .	Cambridge
Aleš Hrdlička . . . . .	Washington, D. C.
Eugene Xavier Louis Henry Hyvernat . . . . .	Washington, D. C.
Carl Newell Jackson . . . . .	Cambridge
James Richard Jewett . . . . .	Cambridge

Alfred Vincent Kidder	Washington, D. C.
Alfred Louis Kroeber	Berkeley, Cal.
Kirsopp Lake	Cambridge
Henry Roseman Lang	New Haven, Conn.
Charles Rockwell Lanman	Cambridge
David Gordon Lyon	Cambridge
Clifford Herschel Moore	Cambridge
George Foot Moore	Cambridge
William Albert Nitze	Chicago, Ill.
Chandler Rathfon Post	Cambridge
Edward Kennard Rand	Cambridge
George Andrew Reisner	Cambridge
Edward Robinson	New York, N. Y.
Fred Norris Robinson	Cambridge
Rudolph Schevill	Berkeley, Cal.
Herbert Weir Smyth	Cambridge
Herbert Joseph Spinden	Brooklyn, N. Y.
Franklin Bache Stephenson	Washington, D. C.
Charles Cutler Torrey	New Haven, Conn.
Alfred Marston Tozzer	Cambridge
Joshua Whatmough	Cambridge
Ernest Hatch Wilkins	Oberlin, Ohio
Clark Wissler	New York, N. Y.
James Haughton Woods	Cambridge

CLASS III., SECTION III.—*Political Economy and History*.—43.

Charles McLean Andrews	New Haven, Conn.
James Phinney Baxter, 3d	Cambridge
Carl Lotus Becker	Ithaca, N. Y.
Robert Pierpont Blake	Cambridge
Charles Jesse Bullock	Cambridge
Thomas Nixon Carver	Cambridge
Edward Channing	Cambridge
John Bates Clark	New York, N. Y.
Arthur Harrison Cole	Cambridge
Richard Henry Dana	Cambridge
Clive Day	New Haven, Conn.

Davis Rich Dewey . . . . .	Cambridge
William Yandell Elliott . . . . .	Cambridge
Ephraim Emerton . . . . .	Cambridge
Henry Walcott Farnam . . . . .	New Haven, Conn.
Max Farrand . . . . .	San Gabriel, Cal.
William Scott Ferguson . . . . .	Cambridge
Irving Fisher . . . . .	New Haven, Conn.
William Cameron Forbes . . . . .	Milton
Worthington Chauncey Ford . . . . .	Cambridge
Edwin Francis Gay . . . . .	Cambridge
Frank Johnson Goodnow . . . . .	Baltimore, Md.
Evarts Boutell Greene . . . . .	New York, N. Y.
Albert Bushnell Hart . . . . .	Cambridge
Charles Homer Haskins . . . . .	Cambridge
Charles Downer Hazen . . . . .	New York, N. Y.
Arthur Norman Holcombe . . . . .	Cambridge
George La Piana . . . . .	Cambridge
Abbott Lawrence Lowell . . . . .	Cambridge
William MacDonald . . . . .	New York, N. Y.
Charles Howard McIlwain . . . . .	Cambridge
Roger Bigelow Merriman . . . . .	Cambridge
Samuel Eliot Morison . . . . .	Boston
William Bennett Munro . . . . .	Boston
Warren Milton Persons . . . . .	New York, N. Y.
Michael Ivanovich Rostovtzeff . . . . .	New Haven, Conn.
Arthur Meier Schlesinger . . . . .	Cambridge
John Osborne Sumner . . . . .	Boston
Frank William Taussig . . . . .	Cambridge
Frederick Jackson Turner . . . . .	San Gabriel, Cal.
Westel Woodbury Willoughby . . . . .	Baltimore, Md.
George Grafton Wilson . . . . .	Cambridge
George Parker Winship . . . . .	Charles River

CLASS III., SECTION IV.—*Literature and the Fine Arts.*—44.

Irving Babbitt . . . . .	Cambridge
George Pierce Baker . . . . .	New Haven, Conn.
Frank Weston Benson . . . . .	Salem

Le Baron Russell Briggs . . . . .	Bournedale
Charles Allerton Coolidge . . . . .	Boston
Frederick Shepard Converse . . . . .	Westwood
Charles Townsend Copeland . . . . .	Cambridge
Wilberforce Eames . . . . .	New York, N. Y.
William Emerson . . . . .	Cambridge
Arthur Fairbanks . . . . .	Hanover, N. H.
Frank Edgar Farley . . . . .	Middletown, Conn.
Edward Waldo Forbes . . . . .	Cambridge
Daniel Chester French . . . . .	New York, N. Y.
Wallace Goodrich . . . . .	Boston
Robert Grant . . . . .	Boston
Morris Gray . . . . .	Boston
Chester Noyes Greenough . . . . .	Cambridge
Edward Burlingame Hill . . . . .	Cambridge
Charles Hopkinson . . . . .	Manchester
Mark Antony DeWolfe Howe . . . . .	Boston
Archer Milton Huntington . . . . .	New York, N. Y.
George Lyman Kittredge . . . . .	Cambridge
William Coolidge Lane . . . . .	Cambridge
John Ellerton Lodge . . . . .	Boston
Charles Martin Tornov Loeffler . . . . .	Medfield
John Livingston Lowes . . . . .	Cambridge
Charles Donagh Maginnis . . . . .	Brookline
Albert Matthews . . . . .	Boston
Harold Murdock . . . . .	Brookline
William Allan Neilson . . . . .	Northampton
Curtis Hidden Page . . . . .	Gilmanton, N. H.
William Lyon Phelps . . . . .	New Haven, Conn.
Arthur Kingsley Porter . . . . .	Cambridge
Herbert Putnam . . . . .	Washington, D. C.
Edwin Arlington Robinson . . . . .	New York, N. Y.
Denman Waldo Ross . . . . .	Cambridge
Paul Joseph Sachs . . . . .	Cambridge
Ellery Sedgwick . . . . .	Boston
Henry Dwight Sedgwick . . . . .	Boston
Richard Clipston Sturgis . . . . .	Boston
Edmund C. Tarbell . . . . .	Boston

Charles Howard Walker . . . . .	Boston
Owen Wister . . . . .	Philadelphia, Pa.
Charles Henry Conrad Wright . . . . .	Cambridge

## ASSOCIATES.—33.

Charles Francis Adams . . . . .	Concord
Francis Noyes Balch . . . . .	Jamaica Plain
Franklin Greene Balch . . . . .	Boston
Charles Foster Batchelder . . . . .	Cambridge
Charles Francis Dorr Belden . . . . .	Jamaica Plain
Roland William Boyden . . . . .	Beverly
Frederick Pickering Cabot . . . . .	Boston
William Brooks Cabot . . . . .	Boston
John Candler Cobb . . . . .	Milton
Howard Coonley . . . . .	Milton
John Albert Cousens . . . . .	Tufts College
Henry Winchester Cunningham . . . . .	Milton
Charles Ernest Fay . . . . .	Somerville
William Lusk Webster Field . . . . .	Milton
Francis Russell Hart . . . . .	Boston
Edward Jackson Holmes . . . . .	Boston
William James . . . . .	Cambridge
Nathaniel Thayer Kidder . . . . .	Milton
Everett Mors . . . . .	Boston
Robert Lincoln O'Brien . . . . .	Dedham
Thomas Nelson Perkins . . . . .	Westwood
Andrew James Peters . . . . .	Jamaica Plain
Anthony John Philpott . . . . .	Arlington
Arthur Stanwood Pier . . . . .	Hyde Park
Alfred Lawrence Ripley . . . . .	Andover
Odin Roberts . . . . .	Boston
Jeremiah Smith, Jr. . . . .	Cambridge
Payson Smith . . . . .	Brookline
Charles Henry Taylor . . . . .	Boston
Eliot Wadsworth . . . . .	Boston
Edwin Sibley Webster . . . . .	Brookline
Edmund Allen Whitman . . . . .	Cambridge
Benjamin Loring Young . . . . .	Weston

#### **FOREIGN HONORARY MEMBERS.—98.**

(Number limited to one hundred.)

CLASS I.—*Mathematical and Physical Sciences*.—33.

**SECTION I.—*Mathematics and Astronomy.*—9.**

Arthur Stanley Eddington . . . . .	Cambridge
Jacques Salomon Hadamard . . . . .	Paris
Godfrey Harold Hardy . . . . .	Oxford
Ejnar Hertzsprung . . . . .	Leyden
Tullio Levi-Civita . . . . .	Rome
Charles Emile Picard . . . . .	Paris
Willem de Sitter . . . . .	Leyden
Charles Jean de la Vallée Poussin . . . . .	Louvain
Hermann Weyl . . . . .	Zürich

CLASS I., SECTION II.—*Physics*.—9.

Vilhelm Frimann Koren Bjercknes	.	.	.	.	.	Oslo
Albert Einstein	.	.	.	.	.	Berlin
James Franck	.	.	.	.	.	Berlin
Abram F. Joffé	.	.	.	.	.	Leningrad
Sir Joseph Larmor	.	.	.	.	.	Cambridge
Friedrich Paschen	.	.	.	.	.	Berlin
Max Planck	.	.	.	.	.	Berlin
Sir Ernest Rutherford	.	.	.	.	.	Cambridge
Sir Joseph John Thomson	.	.	.	.	.	Cambridge

CLASS I., SECTION III.—*Chemistry*.—8.

Johannes N. Brönsted	.	.	.	.	.	Copenhagen
Peter Debye	.	.	.	.	.	Zürich
Fritz Haber	.	.	.	.	.	Berlin
Henri Louis Le Chatelier	.	.	.	.	.	Paris
Archibald Byron Macallum	.	.	.	.	.	London, Ontario
Wilhelm Ostwald	.	.	.	.	.	Leipzig
Sören Peter Lauritz Sørensen	.	.	.	.	.	Copenhagen
Heinrich Wieland	.	.	.	.	.	Munich

CLASS I., SECTION IV.—*Technology and Engineering*.—7.

Joseph Jacques Césaire Joffre	Paris
Maurice d'Ocagne	Paris
Ludwig Prandtl	Göttingen
Emil Probst	Karlsruhe
Aurel Stodola	Zürich
Vsevolod Evgenievich Timonoff	Leningrad
William Cawthorne Unwin	London

CLASS II.—*Natural and Physiological Sciences*.—35.SECTION I.—*Geology, Mineralogy, and Physics of the Globe*.—10.

Frank Dawson Adams	Montreal
Charles Barrois	Lille
Waldemar Christofer Brögger	Oslo
Léon William Collet	Geneva
Viktor Goldschmidt	Heidelberg
Albert Heim	Zürich
Emmanuel de Margerie	Paris
Gustaf Adolf Frederik Molengraaff	Delft
Sir William Napier Shaw	London
Johan Herman Lie Vogt	Trondhjem

CLASS II., SECTION II.—*Botany*.—8.

John Briquet	Geneva
Adolf Engler	Berlin
Carl Hansen Ostenfeld	Copenhagen
Alfred Barton Rendle	London
Otto Renner	Jena
Ignatz Urban	Berlin
Hugo de Vries	Luntern
Richard Wettstein	Vienna

CLASS II., SECTION III.—*Zoology and Physiology*.—9.

Francis Arthur Bather	London
George Albert Boulenger	Brussels
Maurice Caullery	Paris
Louis Dollo	Brussels

Wolfgang Köhler . . . . .	Berlin
Louis Édouard Lapicque . . . . .	Paris
George Henry Falkiner Nuttall . . . . .	Cambridge
Charles Tate Regan . . . . .	London
D'Arcy Wentworth Thompson . . . . .	St. Andrews

CLASS II., SECTION IV.—*Medicine and Surgery*.—8.

Henry Hallett Dale . . . . .	London
Sir Thomas Barlow, Bart. . . . .	London
Sir Robert Jones, Bart. . . . .	Liverpool
Mikinosuke Miyajima . . . . .	Tokyo
Friedrich von Müller . . . . .	Munich
Francis John Shepherd . . . . .	Montreal
Sir Charles Scott Sherrington . . . . .	Oxford
Sir Arnold Theiler. . . . .	London

CLASS III.—*Moral and Political Sciences*.—30.SECTION I.—*Theology, Philosophy, and Jurisprudence*.—9.

Henri Louis Bergson . . . . .	Paris
Francis Crawford Burkitt . . . . .	Cambridge
Benedetto Croce . . . . .	Naples
Étienne Gilson. . . . .	Melun
Edmund Husserl . . . . .	Freiburg i. B.
Raymond Poincaré . . . . .	Paris
Rt. Hon. Sir Frederick Pollock, Bart. . . . .	London
Rufus Daniel Isaacs, Marquess of Reading . . . . .	London
Joseph Redlich . . . . .	Vienna

CLASS III., SECTION II.—*Philology and Archaeology*.—7.

Wilhelm Dörpfeld . . . . .	Athens
Henri Guy . . . . .	Grenoble
Hermann Georg Jacobi . . . . .	Bonn
Arthur Anthony Maedonell . . . . .	Oxford
Alfred Percival Maudslay . . . . .	Hereford
Hanns Oertel . . . . .	Munich
Ramon Menendez Pidal . . . . .	Madrid

CLASS III., SECTION III.—*Political Economy and History*.—5.

Léon Duguit	Bordeaux
Karl Pearson	London
Arthur Cecil Pigou	Cambridge
Henri Pirenne	Ghent
Rt. Hon. Sir George Otto Trevelyan, Bart.	London

CLASS III., SECTION IV.—*Literature and the Fine Arts*.—9.

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Alfredo Casella	Rome
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Jean Adrien Antoine Jules Jusserand	Paris
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The letters A, F, and FHM refer to the lists of Associates, Fellows, and Foreign Honorary Members, respectively. The class and section are indicated by the numerals following.

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 Richardson, W. L. F, II: 4  
 Ripley, A. L. A  
 Ritter, W. E. F, II: 3  
 Roberts, O. A  
 Robinson, B. L. F, II: 2  
 Robinson, E. F, III: 2  
 Robinson, E. A. F, III: 4  
 Robinson, F. N. F, III: 2  
 Rogers, A. F. F, II: 1  
 Root, E. F, III: 1  
 Ropes, J. H. F, III: 1  
 Rosanoff, M. A. F, I: 3  
 Rosenau, M. J. F, II: 4  
 Ross, D. W. F, III: 4  
 Rostovtzeff, M. I. F, III: 3  
 Rowe, A. W. F, I: 3  
 Rugg, A. P. F, III: 1  
 Russell, G. E. F, I: 4  
 Russell, H. N. F, I: 1  
 Rutherford, Sir E. FHM, I: 2  
 Ruthven, A. G. F, II: 3  
 Ryan, J. H. F, III: 1  
 Sachs, P. J. F, III: 4  
 Sanderson, G. A. F, III: 1  
 Sarton, G. F, III: 1  
 Saunders, F. A. F, I: 2  
 Sauveur, A. F, I: 4  
 Sax, K. F, II: 2  
 Sayles, R. W. F, II: 1  
 Scatchard, G. F, I: 3  
 Schaller, W. T. F, II: 1  
 Schevill, R. F, III: 2  
 Schlesinger, A. M. F, III: 3  
 Schlesinger, F. F, I: 1  
 Schuchert, C. F, II: 1  
 Scott, A. W. F, III: 1  
 Scott, W. B. F, II: 1  
 Sedgwick, E. F, III: 4  
 Sedgwick, H. D. F, III: 4  
 Sellards, A. W. F, II: 4  
 Setchell, W. A. F, II: 2  
 Seymour, A. B. F, II: 2  
 Shapley, H. F, I: 1  
 Shaw, Sir W. N. FHM, II: 1  
 Shepherd, F. J. FHM, II: 4  
 Sherrill, M. S. F, I: 3  
 Sherrington, Sir C. S. FHM, II: 4  
 Shimer, H. W. F, II: 1  
 Sims, W. S. F, I: 4  
 Sitter, W. de. FHM, I: 1  
 Slater, J. C. F, I: 2

- Slipher, V. M. F, I: 1  
 Slocum, F. F, I: 1  
 Smith, H. M. F, I: 3  
 Smith, J., Jr. A  
 Smith, P. A  
 Smith, T. F, II: 4  
 Smyth, H. L. F, I: 4  
 Smyth, H. W. F, III: 2  
 Snyder, V. F, I: 1  
 Sørensen, S. P. L. FHM, I: 3  
 Sollmann, T. H. F, II: 4  
 Sperry, W. L. F, III: 1  
 Spinden, H. J. F, III: 2  
 Spofford, C. M. F, I: 4  
 Stafford, R. H. F, III: 1  
 Stakman, E. C. F, II: 2  
 Stebbins, J. F, I: 1  
 Stephenson, F. B. F, III: 2  
 Stetson, H. T. F, I: 1  
 Stevens, J. F. F, I: 4  
 Stieglitz, J. O. F, I: 3  
 Stiles, C. W. F, II: 4  
 Stiles, P. G. F, II: 3  
 Stodola, A. FHM, I: 4  
 Stone, J. S. F, I: 2  
 Stratton, S. W. F, I: 4  
 Strong, R. P. F, II: 4  
 Struik, D. J. F, I: 1  
 Sturgis, R. C. F, III: 4  
 Sturgis, W. C. F, II: 2  
 Sumner, J. O. F, III: 3  
 Swain, G. F. F, I: 4  
 Taber, H. F, I: 1  
 Talbot, F. B. F, II: 4  
 Tamarkin, J. D. F, I: 1  
 Tarbell, E. C. F, III: 4  
 Taussig, F. W. F, III: 3  
 Taylor, C. H. A  
 Taylor, E. W. F, II: 4  
 Taylor, F. B. F, II: 1  
 Thaxter, R. F, II: 2  
 Thayer, J. E. F, II: 3  
 Thayer, W. S. F, II: 4  
 Theiler, Sir A. FHM, II: 4  
 Thompson, D'A. W. FHM, II: 3  
 Thompson, M. deK. F, I: 2  
 Thomson, E. F, I: 2  
 Thomson, Sir J. J. FHM, I: 2  
 Timonoff, V. E. FHM, I: 4  
 Tolman, R. C. F, I: 3  
 Torrey, C. C. F, III: 2  
 Tozzer, A. M. F, III: 2  
 Trelease, W. F, II: 2  
 Trevelyan, Sir G. O. FHM, III: 3  
 Turner, F. J. F, III: 3  
 Tyler, H. W. F, I: 1  
 Tyzzer, E. E. F, II: 4  
 Unwin, W. C. FHM, I: 4  
 Urban, I. FHM, II: 2  
 Vallarta, M. S. F, I: 2  
 Vallée Poussin, C. J. de la. FHM, I: 1  
 Vaughan, T. W. F, II: 1  
 Veblen, O. F, I: 1  
 Verhoeff, F. H. F, II: 4  
 Vogt, J. H. L. FHM, II: 1  
 Vries, H. de. FHM, II: 2  
 Wadsworth, E. A  
 Wait, W. C. F, III: 1  
 Walcott, H. P. F, II: 4  
 Walker, C. H. F, III: 4  
 Walker, W. H. F, I: 3  
 Walsh, J. L. F, I: 1  
 Wambaugh, E. F, III: 1  
 Ward, R. De C. F, II: 1  
 Warner, E. P. F, I: 4  
 Warren, C. H. F, II: 1  
 Washburn, H. B. F, III: 1  
 Watson, J. B. F, II: 3  
 Wearn, J. T. F, II: 4  
 Webster, D. L. F, I: 2  
 Webster, E. S. A  
 Welch, W. H. F, II: 4  
 Wells, A. E. F, I: 4  
 Weston, R. S. F, I: 4  
 Weston, W. H. F, II: 2  
 Weyl, H. FHM, I: 1  
 Weyssse, A. W. F, II: 3  
 Wettstein, R. FHM, II: 2

- Whatmough, J. F, III: 2  
Wheeler, W. M. F, II: 3  
White, B. F, II: 4  
White, D. F, II: 1  
Whitehead, A. N. F, I: 1  
Whitlock, H. P. F, II: 1  
Whitman, E. A. A  
Whitney, W. R. F, I: 3  
Wieland, H. FHM, I: 3  
Wilkins, E. H. F, III: 2  
Williams, F. H. F, II: 4  
Williams, R. S. F, I: 3  
Willis, B. F, II: 1  
Willoughby, W. W. F, III: 3  
Wilson, E. B. F, II: 3  
Wilson, E. B. F, I: 2  
Wilson, E. H. F, II: 2  
Wilson, G. G. F, III: 3  
Winship, G. P. F, III: 3  
Winslow, A. F, II: 1  
Wissler, C. F, III: 2  
Wister, O. F, III: 4  
Wolbach, S. B. F, II: 4  
Wolff, J. E. F, II: 1  
Wood, H. C. F, II: 4  
Wood, R. W. F, I: 2  
Woodman, A. G. F, I: 3  
Woods, F. A. F, II: 3  
Woods, F. S. F, I: 1  
Woods, J. H. F, III: 2  
Worcester, J. R. F, I: 4  
Wright, C. H. C. F, III: 4  
Wright, F. E. F, II: 1  
Wright, Q. F, III: 1  
Yerkes, R. M. F, II: 3  
Young, B. L. A  
Zeleny, J. F, I: 2  
Zinsser, H. F, II: 4



## STATUTES AND STANDING VOTES.

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### STATUTES.

*Adopted November 8, 1911: amended May 8, 1912, January 8, and May 14, 1913, April 14, 1915, April 12, 1916, April 10, 1918, May 14, 1919, February 8, April 12, and December 13, 1922, February 14, March 14, and October 10, 1923, and March 10, 1926, and May 9, 1928.*

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### CHAPTER I.

#### THE CORPORATE SEAL.

ARTICLE 1. The Corporate Seal of the Academy shall be as here depicted:



ARTICLE 2. The Recording Secretary shall have the custody of the Corporate Seal.

*See Chap. v, art. 3; chap. vi, art. 2.*

## CHAPTER II.

### FELLOWS AND FOREIGN HONORARY MEMBERS AND DUES.

ARTICLE 1. The Academy consists of Fellows, who are either citizens or residents of the United States of America, and Foreign Honorary Members. They are arranged in three Classes, according to the Arts and Sciences in which they are severally proficient, and each Class is divided into four Sections, namely:

#### CLASS I. *The Mathematical and Physical Sciences*

- Section 1. Mathematics and Astronomy
- Section 2. Physics
- Section 3. Chemistry
- Section 4. Technology and Engineering

#### CLASS II. *The Natural and Physiological Sciences*

- Section 1. Geology, Mineralogy, and Physics of the Globe
- Section 2. Botany
- Section 3. Zoölogy and Physiology
- Section 4. Medicine and Surgery

#### CLASS III. *The Moral and Political Sciences*

- Section 1. Theology, Philosophy, and Jurisprudence
- Section 2. Philology and Archeology
- Section 3. Political Economy and History
- Section 4. Literature and the Fine Arts

ARTICLE 2. The number of Fellows shall not exceed Six hundred, of whom not more than Four hundred shall be residents of Massachusetts, nor shall there be more than Two hundred and ten in any one Class.

ARTICLE 3. The number of Foreign Honorary Members shall not exceed One hundred. They shall be chosen from among citizens of foreign countries most eminent for their discoveries and attainments in any of the Classes above enumerated. There shall not be more than Thirty-five in any one Class.

ARTICLE 4. If any person, after being notified of his election as Fellow, shall neglect for six months to accept in writing, or, if a Fellow resident within fifty miles of Boston shall neglect to pay his Admission Fee, his election shall be void; and if any Fellow resident within fifty miles of Boston shall neglect to pay his Annual Dues for six months after they are due, provided his attention shall have been called to this Article of the Statutes in the meantime, he shall cease to be a Fellow; but the Council may suspend the provisions of this Article for a reasonable time.

With the previous consent of the Council, the Treasurer may dispense (*sub silentio*) with the payment of the Admission Fee or of the Annual Dues or both whenever he shall deem it advisable. In the case of officers of the Army or Navy who are out of the Commonwealth on duty, payment of the Annual Dues may be waived during such absence if continued during the whole financial year and if notification of such expected absence be sent to the Treasurer. Upon similar notification to the Treasurer, similar exemption may be accorded to Fellows subject to Annual Dues, who may temporarily remove their residence for at least two years to a place more than fifty miles from Boston.

If any person elected a Foreign Honorary Member shall neglect for six months after being notified of his election to accept in writing, his election shall be void.

*See Chap. vii, art. 2.*

ARTICLE 5. Every Fellow resident within fifty miles of Boston hereafter elected shall pay an Admission Fee of Ten dollars.

Every Fellow resident within fifty miles of Boston shall, and others may, pay such Annual Dues, not exceeding Fifteen dollars, as shall be voted by the Academy at each Annual Meeting, when they shall become due; but any Fellow shall be exempt from the annual payment if, at any time after his admission, he shall pay into the treasury Two hundred dollars in addition to his previous payments. Any Fellow shall also be exempt from Annual Dues who has paid such dues for forty years, or, having attained the age of seventy-five has paid dues for twenty-five years. \*

All Commutations of the Annual Dues shall be and remain permanently funded, the interest only to be used for current expenses.

Any fellow not previously subject to Annual Dues who takes up his residence within fifty miles of Boston, shall pay to the Treasurer within three months thereafter Annual Dues for the current year, failing which his Fellowship shall cease; but the Council may suspend the provisions of this Article for a reasonable time.

Only Fellows who pay Annual Dues or have commuted them may hold office in the Academy or serve on the Standing Committees or vote at meetings.

**ARTICLE 6.** Fellows who pay or have commuted the Annual Dues and Foreign Honorary Members shall be entitled to receive gratis one copy of all Publications of the Academy issued after their election.

*See Chap. xi, art. 2.*

**ARTICLE 7.** Diplomas signed by the President and the Vice-President of the Class to which the member belongs, and countersigned by the Secretaries, shall be given to Foreign Honorary Members and to Fellows on request.

**ARTICLE 8.** If, in the opinion of a majority of the entire Council, any Fellow or Foreign Honorary Member shall have rendered himself unworthy of a place in the Academy, the Council shall recommend to the Academy the termination of his membership; and if three-fourths of the Fellows present, out of a total attendance of not less than fifty at a Stated Meeting, or at a Special Meeting called for the purpose, shall adopt this recommendation, his name shall be stricken from the Roll.

*See Chap. iii; chap. vi, art. 1; chap. x, art. 1, 7; chap. xi, art. 2.*

### CHAPTER III.

#### ELECTION OF FELLOWS AND FOREIGN HONORARY MEMBERS.

The procedure in the election of Fellows and Foreign Honorary Members shall be as follows:

Nominations to Fellowship or Foreign Honorary Membership in any Section must be signed by two Fellows of that Section, or by three Fellows of any Sections, and sent to the Corresponding Secretary accompanied by a statement of the qualifications of the nominee and brief biographical data.

Notice shall be sent to every Fellow not later than the fifteenth of January in each year, reminding him that all nominations must be in the hands of the Corresponding Secretary before the fifteenth of February following.

A list of the nominees, giving a brief account of each, with the names of the nominators, shall be sent to every Fellow with a request that he return the list with such confidential comments and indications of preference as he may choose to make.

All the nominations, with any comments thereon and with expressions of preference on the part of the Fellows, shall be referred to the appropriate Class Committees, which shall canvass them, and report their recommendations in writing to the Council before the Stated Meeting of the Academy in April.

Elections of Fellows and Foreign Honorary Members shall be made by the Council before the Annual Meeting in May, and announced at that meeting.

Persons nominated in any year, but not elected, may be carried over to the list of nominees for the next year at the discretion of the Council, but shall not be further continued unless renominated.

*See Chap. ii; chap. vi, art. 1; chap. x, art. 1.*

## CHAPTER IV.

### OFFICERS.

ARTICLE 1. The Officers of the Academy shall be a President (who shall be Chairman of the Council), three Vice-Presidents (one from each Class), a Corresponding Secretary (who shall be Secretary of the Council), a Recording Secretary, a Treasurer, a Librarian, and an Editor, all of whom shall be elected by ballot at the Annual Meeting, and shall hold their respective offices for one year, and until others are duly chosen and installed.

There shall be also twelve Councillors, one from each Section of each Class. At each Annual Meeting three Councillors, one from each Class, shall be elected by ballot to serve for the full term of four years and until others are duly chosen and installed. The same Fellow shall not be eligible for two successive terms.

The Councillors, with the other officers previously named, and the Chairman of the House Committee, *ex officio*, shall constitute the Council.

*See Chap. xi, art. 1.*

**ARTICLE 2.** If any officer be unable, through death, absence, or disability, to fulfil the duties of his office, or if he shall resign, his place may be filled by the Council in its discretion for any part or the whole of the unexpired term.

**ARTICLE 3.** At the Stated Meeting in March, the President shall appoint a Nominating Committee of Three Fellows having the right to vote, one from each Class. This Committee shall prepare a list of nominees for the several offices to be filled, and for the Standing Committees, and file it with the Recording Secretary not later than four weeks before the Annual Meeting.

*See Chap. vi, art. 2.*

**ARTICLE 4.** Independent nominations for any office, if signed by at least twenty Fellows having the right to vote, and received by the Recording Secretary not less than ten days before the Annual Meeting, shall be inserted in the call therefor, and shall be mailed to all the Fellows having the right to vote.

*See Chap. vi, art. 2.*

**ARTICLE 5.** The Recording Secretary shall prepare for use in voting at the Annual Meeting a ballot containing the names of all persons duly nominated for office.

## CHAPTER V.

### THE PRESIDENT.

**ARTICLE 1.** The President, or in his absence the senior Vice-President present (seniority to be determined by length of continuous fellowship in the Academy), shall preside at all meetings of the Academy. In the absence of all these officers, a Chairman of the meeting shall be chosen by ballot.

**ARTICLE 2.** Unless otherwise ordered, all Committees which are not elected by ballot shall be appointed by the presiding officer.

**ARTICLE 3.** Any deed or writing to which the Corporate Seal is to be affixed, except leases of real estate, shall be executed in the name of the Academy by the President or, in the event of his death, absence, or inability, by one of the Vice-Presidents, when thereto duly authorized.

*See Chap. ii, art. 7; chap. iv, art. 1, 3; chap. vi, art. 2; chap. vii, art. 1; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1.*

## CHAPTER VI.

### THE SECRETARIES.

**ARTICLE 1.** The Corresponding Secretary shall conduct the correspondence of the Academy and of the Council, recording or making an entry of all letters written in its name, and preserving for the files all official papers which may be received. At each meeting of the Council he shall present the communications addressed to the Academy which have been received since the previous meeting, and at the next meeting of the Academy he shall present such as the Council may determine.

He shall notify all persons who may be elected Fellows or Foreign Honorary Members, send to each a copy of the Statutes, and on their acceptance issue the proper Diploma. He shall also notify all meetings of the Council; and in case of the death, absence, or inability of the Recording Secretary he shall notify all meetings of the Academy.

Under the direction of the Council, he shall keep a List of the Fellows and Foreign Honorary Members, arranged in their several Classes and Sections. It shall be printed annually and issued as of the first day of July.

*See Chap. ii, art. 7; chap. iii, art. 2, 3; chap. iv, art. 1; chap. x, art. 6; chap. xi, art. 1; chap. xii, art. 1.*

**ARTICLE 2.** The Recording Secretary shall have the custody of the Charter, Corporate Seal, Archives, Statute-Book, Journals, and all literary papers belonging to the Academy.

Fellows borrowing such papers or documents shall receipt for them to their custodian.

The Recording Secretary shall attend the meetings of the Academy and keep a faithful record of the proceedings with the names of the Fellows present; and after each meeting is duly opened, he shall read the record of the preceding meeting.

He shall notify the meetings of the Academy to each Fellow and by mail at least seven days beforehand, and in his discretion may also cause the meetings to be advertised; he shall apprise Officers and Committees of their election or appointment, and inform the Treasurer of appropriations of money voted by the Academy.

After all elections, he shall insert in the Records the names of the Fellows by whom the successful nominees were proposed.

He shall send the Report of the Nominating Committee in print to every Fellow having the right to vote at least three weeks before the Annual Meeting.

*See Chap. iv, art. 3.*

In the absence of the President and of the Vice-Presidents he shall, if present, call the meeting to order, and preside until a Chairman is chosen.

*See Chap. i; chap. ii, art. 7; chap. iv, art. 3, 4, 5; chap. x, art. 6; chap. xi, art. 1, 2; chap. xii, art. 1, 3.*

**ARTICLE 3.** The Secretaries, with the Editor, shall have authority to publish such of the records of the meetings of the Academy as may seem to them likely to promote its interests.

## CHAPTER VII.

### THE TREASURER AND THE TREASURY.

**ARTICLE 1.** The Treasurer shall collect all money due or payable to the Academy, and all gifts and bequests made to it. He shall pay all bills due by the Academy, when approved by the proper officers, except those of the Treasurer's office, which may be paid without such approval; in the name of the Academy he shall sign all leases of real estate; and, with the written consent of a member of the Committee on Finance, he shall make all transfers of stocks, bonds, and other securities belonging to the Academy, all of which shall be in his official custody.

He shall keep a faithful account of all receipts and expenditures, submit his accounts annually to the Auditing Committee, and render them at the expiration of his term of office, or whenever required to do so by the Academy or the Council.

He shall keep separate accounts of the income of the Rumford Fund, and of all other special Funds, and of the appropriation thereof, and render them annually.

His accounts shall always be open to the inspection of the Council.

ARTICLE 2. He shall report annually to the Council at its March meeting on the expected income of the various Funds and from all other sources during the ensuing financial year. He shall also report the names of all Fellows who may be then delinquent in the payment of their Annual Dues.

ARTICLE 3. He shall give such security for the trust reposed in him as the Academy may require.

ARTICLE 4. With the approval of a majority of the Committee on Finance, he may appoint an Assistant Treasurer to perform his duties, for whose acts, as such assistant, he shall be responsible; or, with like approval and responsibility, he may employ any Trust Company doing business in Boston as his agent for the same purpose, the compensation of such Assistant Treasurer or agent to be fixed by the Committee on Finance and paid from the Funds of the Academy.

ARTICLE 5. At the Annual Meeting he shall report in print all his official doings for the preceding year, stating the amount and condition of all the property of the Academy entrusted to him, and the character of the investments.

ARTICLE 6. The Financial Year of the Academy shall begin with the first day of April.

ARTICLE 7. No person or committee shall incur any debt or liability in the name of the Academy, unless in accordance with a previous vote and appropriation therefor by the Academy or the Council, or sell or otherwise dispose of any property of the Academy, except cash or invested funds, without previous consent and approval of the Council.

*See Chap. ii, art. 4, 5; chap. vi, art. 2; chap. x, art. 6; chap. xi, art. 1, 2, 3; chap. xii, art. 1.*

## CHAPTER VIII.

## THE LIBRARIAN AND THE LIBRARY.

ARTICLE 1. The Librarian shall have charge of the printed books, keep a correct catalogue thereof, and provide for their delivery from the Library.

At the Annual Meeting, as Chairman of the Committee on the Library, he shall make a Report on its condition.

ARTICLE 2. In conjunction with the Committee on the Library he shall have authority to expend such sums as may be appropriated by the Academy for the purchase of books, periodicals, etc., and for defraying other necessary expenses connected with the Library.

ARTICLE 3. All books procured from the income of the Rumford Fund or of other special Funds shall contain a book-plate expressing the fact.

ARTICLE 4. Books taken from the Library shall be receipted for to the Librarian or his assistant.

ARTICLE 5. Books shall be returned in good order, regard being had to necessary wear with good usage. If any book shall be lost or injured, the Fellow to whom it stands charged shall replace it by a new volume or by a new set, if it belongs to a set, or pay the current price thereof to the Librarian, whereupon the remainder of the set, if any, shall be delivered to the Fellow so paying, unless such remainder be valuable by reason of association.

ARTICLE 6. All books shall be returned to the Library for examination at least one week before the Annual Meeting.

ARTICLE 7. The Librarian shall have the custody of the Publications of the Academy. With the advice and consent of the President, he may effect exchanges with other associations.

*See Chap. ii, art. 6; chap. xi, art. 1, 2.*

## CHAPTER IX.

## THE EDITOR AND THE PUBLICATIONS.

ARTICLE 1. The Editor shall have charge of the conduct through the press of the Proceedings and the Memoirs, and all correspondence relative thereto, and shall have power to fix the price at which individual numbers of the Proceedings and Memoirs are sold.

ARTICLE 2. In conjunction with the Committee of Publication, he shall have authority to expend such sums as may be appropriated by the Academy for printing the publications and for defraying other expenses therewith connected.

ARTICLE 3. All publications which are financed in whole or in part from the income of the Rumford Fund or from the income of other special funds, and all publications of work done with the aid of the Rumford Fund or other special funds, shall contain a conspicuous statement of this fact.

ARTICLE 4. Two hundred extra copies of each paper printed in the Proceedings or Memoirs shall be placed at the disposal of the author without charge.

If, on account of the number of communications offered for publication, it shall be necessary to decline for publication communications otherwise acceptable, members of the Academy shall be given preference in each of the several Classes over non-members; but whenever it shall be necessary to exercise this preference, the Editor shall inform the Council of the fact.

*See Chap. iv, art. 1; chap. vi, art. 3; chap. x, art. 6; chap. xi, art. 4.*

## CHAPTER X.

## THE COUNCIL.

ARTICLE 1. The Council shall exercise a discreet supervision over all nominations and elections to membership, and in general supervise all the affairs of the Academy not explicitly reserved to the Academy as a whole or entrusted by it or by the Statutes to standing or special committees.

It shall consider all nominations duly sent to it by any Class Committee, and act upon them in accordance with the provisions of Chapter III.

With the consent of the Fellow interested, it shall have power to make transfers between the several Sections, reporting its action to the Academy.

*See Chap. iii, art. 2, 3; chap. xi, art. 1.*

**ARTICLE 2.** Seven members shall constitute a quorum.

**ARTICLE 3.** It shall establish rules and regulations for the transaction of its business, and provide all printed and engraved blanks and books of record.

**ARTICLE 4.** It shall act upon all resignations of officers, and all resignations and forfeitures of Fellowship; and cause the Statutes to be faithfully executed.

It shall appoint all agents and subordinates not otherwise provided for by the Statutes, prescribe their duties, and fix their compensation. They shall hold their respective positions during the pleasure of the Council.

**ARTICLE 5.** It may appoint, for terms not exceeding one year, and prescribe the functions of, such committees of its number, or of the Fellows of the Academy, as it may deem expedient, to facilitate the administration of the affairs of the Academy or to promote its interests.

**ARTICLE 6.** At its March meeting it shall receive reports from the President, the Secretaries, the Treasurer, and the Standing Committees, on the appropriations severally needed for the ensuing financial year. At the same meeting the Treasurer shall report on the expected income of the various Funds and from all other sources during the same year.

A report from the Council shall be submitted to the Academy, for action, at the March meeting, recommending the appropriation which in the opinion of the Council should be made.

On the recommendation of the Council, special appropriations may be made at any Stated Meeting of the Academy, or at a Special Meeting called for the purpose.

*See Chap. xi, art. 3.*

ARTICLE 7. After the death of a Fellow or Foreign Honorary Member, it shall appoint a member of the Academy to prepare a biographical notice for publication in the Proceedings.

ARTICLE 8. It shall report at every meeting of the Academy such business as it may deem advisable to present.

*See Chap. ii, art. 4, 5, 8; chap. iv, art. 1, 2; chap. vi, art. 1; chap. vii, art. 1; chap. xii, art. 1, 4.*

## CHAPTER XI.

### STANDING COMMITTEES.

ARTICLE 1. The Class Committee of each Class shall consist of the Vice-President, who shall be chairman, and the four Councillors of the Class, together with such other officer or officers annually elected as may belong to the Class. It shall consider nominations to Fellowship in its own Class, and report in writing to the Council such as may receive at a Class Committee Meeting a majority of the votes cast, provided at least three shall have been in the affirmative.

*See Chap. iii, art. 2.*

ARTICLE 2. At the Annual Meeting the following Standing Committees shall be elected by ballot to serve for the ensuing year:

(i) *The Committee on Finance*, to consist of three Fellows, who, through the Treasurer, shall have full control and management of the funds and trusts of the Academy, with the power of investing the funds and changing the investments thereof in their discretion.

*See Chap. iv, art. 3; chap. vii, art. 1, 4; chap. x, art. 6.*

(ii) *The Rumford Committee*, to consist of seven Fellows, who shall report to the Academy on all applications and claims for the Rumford Premium. It alone shall authorize the purchase of books, publications and apparatus at the charge of the income from the Rumford Fund, and generally shall see to the proper execution of the trust.

*See Chap. iv, art. 3; chap. x, art. 6.*

(iii) *The Cyrus Moors Warren Committee*, to consist of seven Fellows, who shall consider all applications for appropriations from the

income of the Cyrus Moors Warren Fund, and generally shall see to the proper execution of the trust.

*See Chap. iv, art. 3; chap. x, art. 6.*

(iv) *The Committee of Publication*, to consist of the Editor, *ex officio*, as Chairman, and three other Fellows, one from each Class, to whom all communications submitted to the Academy for publication shall be referred, and to whom the printing of the Proceedings and the Memoirs shall be entrusted.

It shall fix the price at which volumes of the publications shall be sold; but Fellows may be supplied at half price with volumes which may be needed to complete their sets, but which they are not entitled to receive gratis.

It shall determine when the pressure of material offered for publication makes it necessary to give preference to members of the Academy as compared with non-members, or to give priority to certain members as compared with others, and to what extent this preference or priority shall be applied in each of the three Classes, to the end that a proper balance of the facilities of publication with respect to subject matter and authors may be maintained.

*See Chap. iv, art. 3; chap. vi, art. 1, 3; chap. ix; chap. x, art. 6.*

(v) *The Committee on the Library*, to consist of the Librarian, *ex officio*, as Chairman, and three other Fellows, one from each Class, who shall examine the Library and make an annual report on its condition and management.

*See Chap. iv, art. 3; chap. viii, art. 1, 2; chap. x, art. 6.*

(vi) *The House Committee*, to consist of three Fellows, who shall have charge of all expenses connected with the House, including the general expenses of the Academy not specifically assigned to the care of other Committees or Officers.

*See Chap. iv, art. 1, 3; chap. x, art. 6.*

(vii) *The Committee on Meetings*, to consist of the President, the Recording Secretary, and three other Fellows, who shall have charge of plans for meetings of the Academy.

*See Chap. iv, art. 3; chap. x, art. 6.*

(viii) *The Auditing Committee*, to consist of two Fellows, who shall audit the accounts of the Treasurer, with power to employ an expert and to approve his bill.

*See Chap. iv, art. 3; chap. vii, art. 1; chap. x, art. 6.*

ARTICLE 3. The Standing Committees shall report annually to the Council in March on the appropriations severally needed for the ensuing financial year; and all bills incurred on account of these Committees, within the limits of the several appropriations made by the Academy, shall be approved by their respective Chairmen.

In the absence of the Chairman of any Committee, bills may be approved by any member of the Committee whom he shall designate for the purpose.

*See Chap. vii, art. 1, 7; chap. x, art. 6.*

## CHAPTER XII.

### MEETINGS, COMMUNICATIONS, AND AMENDMENTS.

ARTICLE 1. There shall be annually eight Stated Meetings of the Academy, namely, on the second Wednesday of October, November, December, January, February, March, April, and May. Only at these meetings, or at adjournments thereof regularly notified, or at Special Meetings called for the purpose, shall appropriations of money be made or amendments of the Statutes or Standing Votes be effected.

The Stated Meeting in May shall be the Annual Meeting of the Corporation.

Special Meetings shall be called by either of the Secretaries at the request of the President, of a Vice-President, of the Council, or of ten Fellows having the right to vote; and notifications thereof shall state the purpose for which the meeting is called.

A meeting for receiving and discussing literary or scientific communications may be held on the fourth Wednesday of each month, excepting July, August, and September; but no business shall be transacted at said meetings.

ARTICLE 2. Twenty Fellows having the right to vote shall constitute a quorum for the transaction of business at Stated or Special

Meetings. Fifteen Fellows shall be sufficient to constitute a meeting for literary or scientific communications and discussions.

ARTICLE 3. Upon the request of the presiding officer or the Recording Secretary, any motion or resolution offered at any meeting shall be submitted in writing.

ARTICLE 4. No report of any paper presented at a meeting of the Academy shall be published by any Fellow without the consent of the author; and no report shall in any case be published by any Fellow in a newspaper as an account of the proceedings of the Academy without the previous consent and approval of the Council. The Council, in its discretion, by a duly recorded vote, may delegate its authority in this regard to one or more of its members.

ARTICLE 5. No Fellow shall introduce a guest at any meeting of the Academy until after the business has been transacted, and especially until after the result of the balloting upon nominations has been declared.

ARTICLE 6. The Academy shall not express its judgment on literary or scientific memoirs or performances submitted to it, or included in its Publications.

ARTICLE 7. All proposed Amendments of the Statutes shall be referred to a committee, and on its report, at a subsequent Stated Meeting or at a Special Meeting called for the purpose, two-thirds of the ballot cast, and not less than twenty, must be affirmative to effect enactment.

ARTICLE 8. Standing Votes may be passed, amended, or rescinded at a Stated Meeting, or at a Special Meeting called for the purpose, by a vote of two-thirds of the members present. They may be suspended by a unanimous vote.

*See Chap. ii, art. 5, 8; chap. iii; chap. iv, art. 3, 4, 5; chap. v, art. 1; chap. vi, art. 1, 2; chap. x, art. 8.*

## STANDING VOTES.

1. Communications of which notice has been given to either of the Secretaries shall take precedence of those not so notified.

2. Fellows may take from the Library six volumes at any one time, and may retain them for three months, and no longer. Upon special application, and for adequate reasons assigned, the Librarian may permit a larger number of volumes, not exceeding twelve, to be drawn from the Library for a limited period.

3. Works published in numbers, when unbound, shall not be taken from the Hall of the Academy without the leave of the Librarian.

4. The Council, under such rules respecting nominations as it may prescribe, may elect as Associates of the Academy a limited number of men of mark in affairs or of distinguished service in the community.

Associates shall be entitled to the same privileges as Fellows, but shall not have the right to vote.

The admission fee and annual dues of Associates shall be the same as those of Fellows residing within fifty miles of Boston.

5. Communications offered for publication in the Proceedings or Memoirs of the Academy shall not be accepted for publication before the author shall have informed the Committee on Meetings of his readiness, either himself or through some agent, to use such time as the Committee may assign him at such meeting as may be convenient both to him and to the Committee, for the purpose of presenting to the Academy a general statement of the nature and significance of the results contained in his communication.

## RUMFORD PREMIUM.

In conformity with the terms of the gift of Sir Benjamin Thompson, Count Rumford, of a certain Fund to the American Academy of Arts and Sciences, and with a decree of the Supreme Judicial Court of Massachusetts for carrying into effect the general charitable intent and purpose of Count Rumford, as expressed in his letter of gift, the Academy is empowered to make from the income of the Rumford Fund, as it now exists, at any Annual Meeting, an award of a gold and a silver medal, being together of the intrinsic value of three hundred dollars, as a Premium to the author of any important discovery or useful improvement in light or heat, which shall have been made and published by printing, or in any way made known to the public, in any part of the continent of America, or any of the American islands; preference always being given to such discoveries as, in the opinion of the Academy, shall tend most to promote the good of mankind; and, if the Academy sees fit, to add to such medals, as a further Premium for such discovery and improvement, a sum of money not exceeding three hundred dollars.

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